APPENDICES

The Sol of New Orleans II
The University of New Orleans's solar powered car

Appendix A

Abbreviations

BCF	Billion Cubic Feet
BTU	British Thermal Unit
DNR	Louisiana Department of Natural Resources
DOE	United States Department of Energy
DOI	United States Department of the Interior
EIA	Energy Information Administration, DOE
FOB	Free on Board
KWH	Kilowatt-hours
MBBLS	Thousand Barrels
MCF	Thousand Cubic Feet
MMS	Minerals Management Service, DOI
MST	Thousand Short Tons
NGC	Natural Gas Clearinghouse
OCS	Outer Continental Shelf
OPEC	Organization of Petroleum Exporting Countries
RAC	Refinery Acquisition Costs
SLS	South Louisiana Sweet Crude Oil
SPR	Strategic Petroleum Reserve
TBTU	Trillion BTU
TCF	Trillion Cubic Feet

State Abbreviations Used in the Louisiana Energy Facts Annual

AL	Alabama
AK	Alaska
CA	California
CO	Colorado
IL	Illinois
KS	Kansas
LA	Louisiana
MI	Michigan
MS	Mississippi
ND	North Dakota
NM	New Mexico
OK	Oklahoma
TX	Texas
UT	Utah
WY	Wyoming

Appendix B

Data Sources*

1. EMPLOYMENT AND TOTAL WAGES PAID BY EMPLOYERS SUBJECT TO LOUISIANA EMPLOYMENT SECURITY LAW, Baton Rouge, LA: Louisiana Department of Labor, Office of Employment Security, Research and Statistics Unit.
2. MONTHLY ENERGY REVIEW and ANNUAL ENERGY REVIEW, Washington, D.C.: U.S. Department of Energy, Energy Information Administration.
3. NATURAL GAS MONTHLY and NATURAL GAS ANNUAL, Washington, D.C.: U.S. Department of Energy, Energy Information Administration.
4. Baker Hughes from OIL & GAS JOURNAL, Tulsa, OK: Penn Well Publishing Co.
5. October 2002 to Present, NATURAL GAS WEEK, Washington, D.C.: Energy Intelligence Group. Prior, SURVEY OF DOMESTIC SPOT MARKET PRICES, Houston, TX: Dynegy Inc. (Formerly Natural Gas Clearinghouse).
6. PETROLEUM MARKETING MONTHLY and PETROLEUM MARKETING ANNUAL, Washington, D.C.: U.S. Department of Energy, Energy Information Administration.
7. PETROLEUM SUPPLY MONTHLY and PETROLEUM SUPPLY ANNUAL, Washington, D.C.: U.S. Department of Energy, Energy Information Administration.
8. SEVERANCE TAX, Baton Rouge, LA: Louisiana Department of Revenue and Taxation, Severance Tax Section.
9. U.S. CRUDE OIL, NATURAL GAS and NATURAL GAS LIQUIDS RESERVES, Washington, D.C.: U.S. Department of Energy, Energy Information Administration.
10. THE WALL STREET JOURNAL, Gulf Coast Edition, Beaumont, TX: Dow Jones and Company.
11. STATE ENERGY DATA REPORT, Washington, D.C.: U.S. Department of Energy, Energy Information Administration.
12. FEDERAL OFFSHORE STATISTICS, Washington, D.C.: U.S. Department of the Interior, Minerals Management Service.
13. MINERAL REVENUE, Washington, D.C.: U.S. Department of the Interior, Minerals Management Service, Royalty Management Program.
14. ELECTRIC POWER MONTHLY, Washington, D.C.: U.S. Department of Energy, Energy Information Administration.

* Unless otherwise specified, data is from the Louisiana Department of Natural Resources.

Appendix C

Glossary

Bonus. A cash payment by the lessee for the execution of a lease. A lease is a contract that gives a lessee the right: (a) to search for minerals, (b) to develop the surface for extraction, and (c) to produce minerals within the area covered by the contract.

Casinghead Gas. All natural gas released from oil during the production of oil from underground reservoirs.

City-Gate. A point or measuring station at which a gas distribution company receives gas from a pipeline company or transmission system.

Commercial Consumption. Gas used by non-manufacturing organizations such as hotels, restaurants, retail stores, laundries, and other service enterprises. This also includes gas used by local, state, and federal agencies engaged in non-manufacturing activities.

Condensate. (See Lease Condensate).

Crude Oil. A mixture of hydrocarbons that existed in the liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities.

CRUDE OIL PRICES

Domestic Wellhead. The average price at which all domestic crude oil is first purchased.

Imports FOB. The price actually charged at the producing country's port of loading. It is the responsibility of the buyer to arrange for transportation and insurance.

Imports Landed. The dollar per barrel price of crude oil at the port of discharge. It includes crude oil landed in the U.S. and U.S. company-owned refineries in the Caribbean, but excludes crude oil from countries that export only small amounts to the United States. The landed price does not include charges incurred at the port of discharge.

Imports OPEC FOB. The average price actually charged by OPEC at their country's port of loading. This price does not include transportation or insurance.

OCS Gulf. The average price at which all offshore, Outer Continental Shelf, Central Gulf region crude oil is first purchased as reported by the U.S. Department of Energy, Energy Information Administration.

Refinery Acquisition Costs (RAC). The average price paid by refiners in the U.S. for crude oil booked into their refineries in accordance with accounting procedures generally accepted and consistently and historically applied by the refiners.

a) **Domestic**. The average price of crude oil produced in the United States or from the Outer Continental Shelf of the U.S.

b**) Imports**. The average price of any crude oil not reported as domestic.

Refinery Posted. The average price from a survey of selected refiners' postings for South Louisiana Sweet (SLS) crude, which is effective at the middle and at the end of the month.

Severance Tax. The average wellhead price calculated from oil severance taxes paid to the Louisiana Department of Revenue and Taxation.

Spot Market. The spot market crude oil price is the average of daily South Louisiana Sweet (SLS) crude price futures traded in the month and usually includes transportation from the producing field to the St. James, Louisiana terminal.

State. The average price at which all Louisiana crude oil, excluding Louisiana OCS, is first purchased as reported in a survey by the U.S. Department of Energy, Energy Information Administration.

State Royalty. The average wellhead price from its royalty share of oil produced in state lands or water bottoms. The price is calculated by the ratio of received oil royalty gross revenue divided by royalty volume share reported to the Louisiana Department of Natural Resources.

Developmental Well. Wells drilled within the proved area of an oil or gas reservoir to the depth of a stratigraphic horizon known to be productive.

Dry Gas. (See Natural Gas, "Dry").

Dry Hole. An exploratory or developmental well found to be incapable of producing either oil or gas in sufficient quantities to justify completion as an oil or gas well.

Electric Utility Consumption. Gas used as fuel in electric utility plants.

Exploratory Well. A well drilled to find and produce oil or gas in an unproved area, to find a new reservoir in an old field, or to extend the limits of a known oil or gas reservoir.

Exports. Crude oil or natural gas delivered out of the Continental United States and Alaska to foreign countries.

Extraction Loss. The reduction in volume of natural gas resulting from the removal of natural gas liquid constituents at natural gas processing plants.

Federal Offshore or Federal OCS. (See Louisiana OCS)

FOB Price (Free on board). The price actually charged at the producing country's port of loading. The reported price includes deductions for any rebates and discounts or additions of premiums where applicable and should be the actual price paid with no adjustment for credit terms.

Gate. (See City-Gate)

Gross Revenue. Amount of money received from a purchaser, including charges for field gathering, transportation from wellhead to purchaser receiving terminal, and state production severance tax.

Gross Withdrawals. (See Natural Gas, Gross Withdrawals)

Imports. Crude oil or natural gas received in the Continental United States, Alaska, and Hawaii from foreign countries.

Industrial Consumption. Natural gas used by manufacturing and mining establishments for heat, power, and chemical feedstock.

Lease Condensate. A mixture consisting primarily of pentane and heavier hydrocarbons that is recovered as a liquid from natural gas in lease or field separation facilities, exclusive of products recovered at natural gas processing plants or facilities.

Lease Separator. A facility installed at the surface for the purpose of: (a) separating gases from produced crude oil and water at the temperature and pressure conditions of the separator, and/or (b) separating gases from that portion of the produced natural gas stream which liquefies at the temperature and pressure conditions of the separator.

Louisiana OCS. Submerged lands under federal regulatory jurisdiction that comprise the Continental Margin or Outer Continental Shelf adjacent to Louisiana and seaward of the Louisiana Offshore region.

Louisiana Offshore. A 3-mile strip of submerged lands under state regulatory jurisdiction located between the State coast line and the OCS region.

Louisiana Onshore. Region defined by the State boundary and the coast line.

Major Pipeline Company. A company whose combined sales for resale, and gas transported interstate or stored for a fee, exceeded 50 million thousand cubic feet in the previous year.

Marketed Production. (See Natural Gas, Marketed Production)

Natural Gas. A mixture of hydrocarbon compounds and small quantities of various non-hydrocarbons existing in the gaseous phase or in solution with crude oil in natural underground reservoirs at reservoir conditions. The principal hydrocarbons usually contained in the mixture are methane, ethane, propane, butanes and pentanes. Typical non-hydrocarbon gases that may be present in reservoir natural gas are carbon dioxide, helium, hydrogen sulfide and nitrogen. Under reservoir conditions, natural gas and the liquefiable portions occur either in a single gaseous phase in the reservoir or in solution with crude oil, and are not distinguishable at the time as separated substances.

Natural Gas, "Dry". The actual or calculated volume of natural gas which remains after: (a) the liquefiable hydrocarbon portion has been removed from the gas stream, and (b) any volumes of non-hydrocarbon gases have been removed where they occur in sufficient quantity to render the gas unmarketable.

Natural Gas, Gross Withdrawals. Full well-stream volume, including all natural gas plant liquids and all non-hydrocarbon gases, but excluding lease condensate.

Natural Gas Liquids. Lease condensate plus natural gas plant liquids.

Natural Gas, Marketed Production. Gross withdrawals less gas used for repressurizing, quantities vented and flared, and non-hydrocarbon gases removed in treating or processing operations. It includes all quantities of gas used in field and processing operations.

Natural Gas, OCS Gas. OCS gas volume is as reported. Most is "dry" gas, though some is "wet" gas.

Natural Gas Plant Liquids. Those hydrocarbons remaining in a natural gas stream after field separation and later separated and recovered at a natural gas processing plant or cycling plant through the processes of absorption, adsorption, condensation, fractionation or other methods. Generally such liquids consist of propane and heavier hydrocarbons and are commonly referred to as condensate, natural gasoline, or liquefied petroleum gases. Where hydrocarbon components lighter than propane (e.g., ethane) are recovered as liquids, these components are included with natural gas liquids.

NATURAL GAS PRICES

Henry Hub Settled NYMEX The last trading day price for the month before delivery posted in the New York Mercantile Exchange for natural gas at Henry Hub.

Spot Market The average price of natural gas paid at the regional spot market receipt points or zones as reported by the Energy Intelligence Group's NATURAL GAS WEEK. The data are a volume weighted average and reflect market activity information gathered during the entire month before the publication date, regardless of delivery date. The data are not an arbitrary weighting by production zone, but a true deal-by-deal volume weighting of prices gathered. Data prior to October 2002 were from Dynegy's survey of the domestic natural gas spot market receipt points or zones located in Louisiana. The new and old points or zones are as follows:

NATURAL GAS PIPELINES AND SALES POINTS FOR PRICES

Dynegy	Natural Gas Week
ANR Eunice, LA	ANR Patterson, LA
COLUMBIA GULF Average Louisiana onshore laterals	COLUMBIA GULF TRANSMISSION Co. Average of Erath, Rayne, and Texaco Henry Plant in Louisiana
LOUISIANA INTRASTATES Average of Faustina, LIG, Bridgeline, and Monterrey pipelines	LOUISIANA INTRASTATES Average of LIG, Bridgeline, LRC, and Acadian pipelines
SOUTHERN NATURAL South Louisiana	SONAT Saint Mary Parish, LA
TENNESSEE GAS Vinton, LA	TENNESSEE GAS Average Zone 1 of 500 & 800
TEXAS GAS TRANSMISSION Zone 1 (North Louisiana)	TEXAS GAS TRANSMISSION Zone 1 (North Louisiana)
GULF SOUTH PIPELINE	TRUNKLINE GAS Co.

OCS. The average wellhead price calculated from sales and volumes from Louisiana OCS natural gas as reported by the U.S. Department of Interior, Minerals Management Service.

State Royalty. The average wellhead price calculated from revenue received and volumes reported to the Louisiana Department of Natural Resources.

State Wells. The average price of gas sold at Louisiana wellhead. This price includes: (a) value of natural gas plant liquids subsequently removed from the gas, (b) gathering and compression charges, and (c) State production, severance, and/or similar charges.

Major Pipelines Purchases.

a) **Domestic Producers**. The average price of natural gas produced in the United States or from the Outer Continental Shelf of the U.S.

b**) Foreign Imports**. The average price of any natural gas not reported as domestic.

Wellhead. The wellhead sales price including: (a) value of natural gas plant liquids subsequently removed from the gas, (b) gathering and compression charges, and (c) State production, severance, and/or similar charges.

Natural Gas, Wet After Lease Separation. The volume of natural gas, if any, remaining after: (a) removal of lease condensate in lease and/or field separation facilities, and (b) exclusion of non-hydrocarbon gases where they occur in sufficient quantities to render the gas unmarketable. Also excludes gas returned to formation in pressure maintenance and secondary recovery projects and gas returned to earth from cycling and/or gasoline plants. Natural gas liquids may be recovered from volumes of natural gas, wet after lease separation, at natural gas processing plants.

Organization of Petroleum Exporting Countries (OPEC). Countries that have organized for the purpose of negotiating with oil companies on matters of oil production, prices, and future concession rights. Current members are Algeria, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela.

Outer Continental Shelf (OCS). All submerged lands that comprise the Continental Margin adjacent to the U.S. and seaward of the state offshore lands. Production in the OCS is under federal regulatory jurisdiction and ownership.

Processing Plant. A facility designed to recover natural gas liquids from a stream of natural gas which may or may not have passed through lease separators and/or field separation facilities. Another function of natural gas processing plants is to control the quality of the processed natural gas stream.

Proved Reserves of Crude Oil. As of December 31 of the report year, the estimated quantities of all liquids defined as crude oil which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions. Volumes of crude oil in underground storage are not considered proved reserves.

Proved Reserves of Lease Condensate. The volumes of lease condensate as of December 31 of the report year expected to be recovered in future years in conjunction with the production of proved reserves of natural gas as of December 31 of the report year.

Proved Reserves of Natural Gas. The estimated quantities of natural gas as of December 31 of the report year which analysis of geologic and engineering data demonstrates with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions. Volumes of natural gas in underground storage are not considered proved reserves.

Proved Reserves of Natural Gas Liquids. The volumes of natural gas liquids (including lease condensate) as of December 31 of the report year, which analysis of geologic and engineering data demonstrates with reasonable certainty to be separable in the future from proved natural gas reserves under existing economic and operating conditions.

Rental. Money paid by the lessee to maintain the lease after the first year if it is not producing. A lease is considered expired when rental is not paid on time on an unproductive lease.

Reservoir. A porous and permeable underground formation containing an individual and separate natural accumulation of producible hydrocarbons (oil and/or gas) which is confined by impermeable rock or water barriers and is characterized by a single natural pressure system. Reservoirs are considered proved if economic producibility is supported by actual production or conclusive formation tests (drill stem or wire line), or if economic producibility is supported by core analysis and/or electric or other log interpretations. The area of a gas or oil reservoir considered proved includes: (a) that portion delineated by drilling and defined by gas-oil and/or gas-water contacts, if any; and (b) the immediately adjoining portions not yet drilled, but which can be reasonably judged as economically productive on the basis of available geological and engineering data.

Residential Consumption. Gas used in private dwellings, including apartments, for heating, cooking, water heating, and other household uses.

Royalty (Including Royalty Override) Interest. Those interests which entitle their owner(s) to a share of the mineral production from a property or to a share of the proceeds from there. These interests do not contain the rights and obligations of operating the property and normally do not bear any of the costs of exploration, development, or operation of the property.

Royalty Override (Or Overriding Royalty). An interest in oil and gas produced at the surface free of any cost of production. It is royalty in addition to the usual landowner's royalty reserved to the lessor. The Layman's Guide to Oil & Gas by Brown & Miller defines overriding royalty as a percentage of all revenue earned by a well and carrying no cost obligation.

State Offshore. (See Louisiana Offshore**).**

Wet After Lease Separation. (See Natural Gas, Wet After Lease Separation).

Wildcat Well . (See Developmental Well).

Appendix D

Louisiana Gas Volume at 14.73 psia

Page

Appendix D-1

LOUISIANA STATE GAS PRODUCTION, WET AFTER LEASE SEPARATION

Natural Gas and Casinghead Gas, Excluding OCS

(Thousand Cubic Feet (MCF) at 14.73 psia and 60 degrees Fahrenheit)*

DATE	NORTH	SOUTH	OFFSHORE	TOTAL
1983	367,415,635	1,330,669,947	323,523,633	2,021,609,215
1984	389,939,125	1,400,621,534	320,286,543	2,110,847,202
1985	358,032,963	1,274,608,554	255,072,018	1,887,713,536
1986	370,901,958	1,240,893,984	251,033,103	1,862,829,044
1987	363,802,599	1,175,490,485	232,692,536	1,771,985,620
1988	382,100,449	1,192,889,101	218,544,278	1,793,533,828
1989	386,783,455	1,153,294,096	207,381,469	1,747,459,020
1990	398,236,494	1,160,425,829	185,678,416	1,744,340,739
1991	389,623,599	1,139,243,110	152,895,972	1,681,762,681
1992	379,671,005	1,146,893,542	149,933,256	1,676,497,803
1993	360,897,088	1,126,950,007	156,919,403	1,644,766,497
1994	361,146,486	1,048,229,785	158,315,609	1,567,691,880
1995	370,709,558	1,028,500,599	167,742,330	1,566,952,486
1996	425,506,052	1,048,009,685	189,331,696	1,662,847,432
1997	450,873,442	995,341,920	189,565,415	1,635,780,777
1998	446,138,374	979,584,537	183,246,642	1,608,969,552
1999	402,085,989	928,879,872	152,594,840	1,483,560,702
2000	395,888,433 r	946,027,766 r	152,509,834 r	1,494,426,032 r
2001	398,416,780 r	973,262,804 r	153,910,366 r	1,525,589,950 r
2002	359,485,528 r	892,444,993 r	137,217,944 r	1,389,148,465 r
January	29,736,562 r	74,016,455 r	11,153,011 r	114,906,028 r
February	27,407,793 r	68,392,569 r	10,288,308 r	106,088,670 r
March	30,850,866 r	77,204,917 r	11,591,019 r	119,646,803 r
April	29,758,881 r	74,674,571 r	11,192,676 r	115,626,128 r
May	30,302,640 r	76,935,499 r	11,517,367 r	118,755,506 r
June	29,087,392 r	74,040,155 r	11,071,572 r	114,199,119 r
July	29,514,458 r	75,320,074 r	11,246,945 r	116,081,476 r
August	29,669,517	75,949,874	11,320,598	116,939,989
September	28,110,563	72,149,977	10,739,511	111,000,052
October	29,167,317	75,066,978	11,158,098	115,392,393
November	27,940,549	72,133,011	10,704,123	110,777,683
December	28,481,000	73,730,302	10,925,539	113,136,841
2003 Total	**350,027,540**	**889,614,383**	**132,908,765**	**1,372,550,688**
January	27,993,648	72,553,857	10,741,481	111,288,986
February	26,688,221	69,342,471	10,252,124	106,282,816
March	28,979,227	75,493,683	11,144,951	115,617,862
April	28,360,821	74,098,861	10,920,239	113,379,921
May	29,299,475	76,751,566	11,293,703	117,344,745
June	28,289,228	74,307,797	10,915,921	113,512,946
July	29,180,675	76,858,333	11,272,853	117,311,861
August	29,058,187	76,781,605	11,240,335	117,080,127
September	23,270,135	66,179,819	9,103,628	98,553,583
October	25,775,249	77,411,648	9,774,891	112,961,788
November	25,629,464 e	75,169,584 e	9,729,251 e	110,528,300 e
December	25,482,385 e	74,964,929 e	9,734,249 e	110,181,564 e
2004 Total	**328,006,717 e**	**889,914,153 e**	**126,123,627 e**	**1,344,044,496 e**

e Estimated   r Revised   p Preliminary

* See Table 11 corresponding volumes at 15.025 psia and footnote in Appendix B.

Appendix D-2

LOUISIANA STATE GAS PRODUCTION, WET AFTER LEASE SEPARATION

Natural Gas and Casinghead Gas

(Thousand Cubic Feet (MCF) at 14.73 psia and 60 degrees Fahrenheit)*

DATE	ONSHORE	OFFSHORE State	OFFSHORE Federal OCS[12]	TOTAL
1983	1,698,085,582	323,523,633	3,803,740,050	5,825,349,265
1984	1,790,560,659	320,286,543	3,173,892,354	5,284,739,556
1985	1,632,641,518	255,072,018	3,578,740,570	5,466,454,106
1986	1,611,795,941	251,033,103	3,116,884,490	4,979,713,534
1987	1,539,293,084	232,692,536	2,927,832,264	4,699,817,884
1988	1,574,989,550	218,544,278	3,180,107,195	4,973,641,023
1989	1,540,077,551	207,381,469	3,096,881,628	4,844,340,648
1990	1,558,662,324	185,678,416	3,006,576,061	4,750,916,800
1991	1,528,866,709	152,895,972	3,706,324,044	5,388,086,725
1992	1,526,564,547	149,933,256	3,289,968,602	4,966,466,405
1993	1,487,847,094	156,919,403	3,338,101,447	4,982,867,944
1994	1,409,376,270	158,315,609	3,386,808,653	4,954,500,533
1995	1,399,210,157	167,742,330	3,492,406,762	5,059,359,248
1996	1,473,515,737	189,331,696	3,636,067,997	5,298,915,429
1997	1,446,215,363	189,565,415	3,898,234,094	5,534,014,871
1998	1,425,722,911	183,246,642	3,913,885,048	5,522,854,600
1999	1,330,965,862	152,594,840	3,789,387,595	5,272,948,297
2000	1,341,916,199 r	152,509,834 r	3,987,022,817	5,481,448,849 r
2001	1,371,679,584 r	153,910,366 r	3,663,809,133	5,189,399,083 r
2002	1,251,930,521 r	137,217,944 r	3,414,901,105	4,804,049,570 p r
January	103,753,018 r	11,153,011 r	289,439,942 p r	404,345,971 p r
February	95,800,362 r	10,288,308 r	265,663,155 p r	371,751,825 p r
March	108,055,784 r	11,591,019 r	298,364,598 p r	418,011,401 p r
April	104,433,452 r	11,192,676 r	290,699,540 p r	406,325,668 p r
May	107,238,139 r	11,517,367 r	294,724,090 p r	413,479,596 p r
June	103,127,547 r	11,071,572 r	278,110,326 p r	392,309,445 p r
July	104,834,532 r	11,246,945 r	285,643,863 p r	401,725,339 p r
August	105,619,391	11,320,598	283,239,655 p	400,179,644 p
September	100,260,540	10,739,511	268,571,653 p	379,571,705 p
October	104,234,295	11,158,098	278,270,406 p	393,662,799 p
November	100,073,560	10,704,123	260,694,658 p	371,472,341 p
December	102,211,303	10,925,539	270,558,000 p	383,694,841 p
2003 Total	**1,239,641,922**	**132,908,765**	**3,363,979,887 p**	**4,736,530,574 p**
January	100,547,505	10,741,481	276,828,182 e	388,117,167 e
February	96,030,692	10,252,124	264,084,900 e	370,367,716 e
March	104,472,910	11,144,951	270,164,188 e	385,782,049 e
April	102,459,682	10,920,239	248,893,068 e	362,272,989 e
May	106,051,042	11,293,703	261,933,212 e	379,277,957 e
June	102,597,025	10,915,921	246,899,958 e	360,412,903 e
July	106,039,009	11,272,853	N/A	117,311,861
August	105,839,792	11,240,335	N/A	117,080,127
September	89,449,954	9,103,628	N/A	98,553,583
October	103,186,897	9,774,891	N/A	112,961,788
November	100,799,048 e	9,729,251 e	N/A	110,528,300 e
December	100,447,315 e	9,734,249 e	N/A	110,181,564 e
2004 Total	**1,217,920,869 e**	**126,123,627 e**	**1,568,803,507**	**2,912,848,003 e**

e Estimated r Revised p Preliminary

* See Table 12 corresponding volumes at 15.025 psia and footnote in Appendix B.

NOTE: The 2003 Federal OCS production is estimated from the marketed production

Appendix D-3

LOUISIANA MARKETED AND DRY GAS PRODUCTION
(Billion Cubic Feet (BCF) at 14.73 psia and 60 degrees Fahrenheit)*

	MARKETED			EXTRACTION	
DATE	State	OCS	Total[3]	LOSS[3]	DRY[3]
1961	2,785 e	315 [12]	3,100 e	N/A	N/A
1962	3,055 e	447 [12]	3,502 e	N/A	N/A
1963	3,317 e	559 [12]	3,876 e	N/A	N/A
1964	3,520 e	616 [12]	4,136 e	N/A	N/A
1965	3,731 e	639 [12]	4,370 e	N/A	N/A
1966	4,145 e	956 [12]	5,101 e	N/A	N/A
1967	4,640	1,076 [12]	5,717	115	5,602
1968	5,017	1,399 [12]	6,416	140	6,276
1969	5,424	1,804 [12]	7,228	179	7,049
1970	5,538	2,250 [12]	7,788	193	7,595
1971	5,474	2,608 [12]	8,082	195	7,887
1972	5,120	2,853 [12]	7,973	198	7,775
1973	5,217	3,025 [12]	8,242	207	8,036
1974	4,438	3,316 [12]	7,754	194	7,559
1975	3,792	3,299 [12]	7,091	190	6,901
1976	3,542	3,465 [12]	7,007	173	6,834
1977	3,604	3,611 [12]	7,215	166	7,049
1978	3,368	4,108 [12]	7,476	162	7,315
1979	3,149	4,117 [12]	7,266	166	7,101
1980	2,966	3,974 [12]	6,940	142	6,798
1981	2,715	4,065 [12]	6,780	142	6,638
1982	2,406	3,766 [12]	6,172	129	6,043
1983	2,190	3,142 [12]	5,332	124	5,208
1984	2,282	3,543 [12]	5,825	133	5,693
1985	1,928	3,086 [12]	5,014	118	4,896
1986	1,997	2,899 [12]	4,895	116	4,780
1987	1,974	3,148 [12]	5,123	125	4,998
1988	2,114	3,066 [12]	5,180	120	5,060
1989	2,102	2,977 [12]	5,078	121	4,957
1990	1,573	3,669 [12]	5,242	119	5,123
1991	1,777	3,257 [12]	5,034	129	4,905
1992	1,649	3,265 [3]	4,914	133	4,782
1993	1,674	3,317 [3]	4,991	130	4,861
1994	1,691	3,479 [3]	5,170	129	5,041
1995	1,683	3,425 [3]	5,108	146	4,962
1996	1,628	3,662 [3]	5,290	140	5,150
1997	1,505 [3]	3,725 [3]	5,230	150	5,080
1998	1,552 [3]	3,725 [3]	5,277	145	5,133
1999	1,567 [3]	3,709 [3]	5,276	165	5,111
2000	1,455 [3]	3,567 [3]	5,022	162	4,831
2001	1,502 [3]	3,673 [3]	5,175	150	4,996
2002	1,362 [3]	3,736 [3]	5,098	172	5,072
2003	1,372 p	3,300 e	4,672 e	172	4,509 p

e Estimated r Revised p Preliminary

* See Table 13 corresponding volumes at 15.025 psia and footnote in Appendix B.

Appendix D-4

UNITED STATES OCS GAS PRODUCTION[12]

Natural Gas and Casinghead Gas

(Thousand Cubic Feet (MCF) at 14.73 psia and 60 degrees Fahrenheit)*

YEAR	LOUISIANA	TEXAS	CALIFORNIA	TOTAL
1956	82,892,538	0	0	82,892,538
1957	82,568,807	4,797	0	82,573,604
1958	127,692,849	0	0	127,692,849
1959	207,156,297	0	0	207,156,297
1960	273,034,452	0	0	273,034,452
1961	318,280,097	0	0	318,280,097
1962	451,952,661	0	0	451,952,661
1963	564,352,609	0	0	564,352,609
1964	621,731,441	0	0	621,731,441
1965	645,589,472	0	0	645,589,472
1966	965,387,854	42,059,386	0	1,007,447,240
1967	1,087,262,810	99,952,947	0	1,187,215,756
1968	1,413,467,614	109,910,788	799,685	1,524,178,086
1969	1,822,544,152	127,096,983	4,845,851	1,954,486,985
1970	2,273,147,052	133,300,405	12,229,147	2,418,676,604
1971	2,634,014,045	127,357,909	15,671,479	2,777,043,433
1972	2,881,364,748	147,156,460	10,033,581	3,038,554,789
1973	3,055,628,252	148,673,638	7,286,549	3,211,588,439
1974	3,349,170,882	159,979,402	5,573,642	3,514,723,926
1975	3,332,169,075	122,572,765	3,951,633	3,458,693,473
1976	3,499,865,919	92,582,425	3,475,201	3,595,923,545
1977	3,647,513,694	86,943,285	3,289,963	3,737,746,942
1978	4,149,731,158	231,857,451	3,472,292	4,385,060,901
1979	4,158,521,732	511,590,610	2,866,822	4,672,979,164
1980	4,013,707,456	624,642,529	3,107,023	4,641,457,008
1981	4,106,494,612	730,275,835	12,766,307	4,849,536,754
1982	3,803,740,070	858,020,303	17,750,924	4,679,511,297
1983	3,173,892,371	850,817,216	16,024,292	4,040,733,879
1984	3,578,740,589	931,293,587	27,806,899	4,537,841,075
1985	3,116,884,507	834,926,527	49,164,213	4,000,975,247
1986	2,927,832,280	978,370,557	42,689,021	3,948,891,858
1987	3,180,107,212	1,204,488,343	40,986,158	4,425,581,714
1988	3,096,881,645	1,178,422,567	34,570,638	4,309,874,850
1989	3,006,576,077	1,165,112,959	28,574,912	4,200,263,949
1990	3,706,324,064	1,348,075,368	38,531,764	5,092,931,196
1991	3,289,968,620	1,184,936,500	40,626,577	4,515,531,697
1992	3,338,101,465	1,239,389,554	40,873,660	4,685,644,750
1993	3,386,808,671	1,027,937,761	42,082,090	4,533,389,755
1994	3,492,406,781	1,014,204,140	41,679,064	4,657,017,854
1995	3,636,068,016	908,520,055	36,425,501	4,692,270,850
1996	3,898,234,115	972,873,764	37,822,941	5,024,420,834
1997	3,913,885,048	965,334,787	40,722,084	5,076,996,337
1998	3,789,387,595	867,606,779	26,431,191	4,835,387,697
1999	3,987,022,817	814,124,878	37,261,450	4,992,363,948
2000	3,661,353,702	865,548,000	36,712,196	4,673,123,023
2001	3,857,433,283	813,326,711	41,266,568	4,712,026,562
2002	3,396,472,994	996,962,430	40,392,325	4,433,827,749
2003	3,363,979,887 p	N/A	N/A	4,152,432,627 p

e Estimated r Revised p Preliminary

* See Table 15 corresponding volumes at 15.025 psia and footnote in Appendix B.

Appendix D-5

UNITED STATES NATURAL GAS AND CASINGHEAD GAS PRODUCTION[3]

(Billion Cubic Feet (BCF) at 14.73 psia and 60 degrees Fahrenheit)*

DATE	GROSS	WET AFTER LEASE SEPARATION	MARKETED	DRY	GROSS IMPORTS
1983	18,659	16,979	16,884	16,094	918
1984	20,267	18,412	18,304	17,466	843
1985	19,607	17,365	17,270	16,454	950
1986	19,131	16,956	16,859	16,059	750
1987	20,140	17,557	17,433	16,621	993
1988	20,999	18,061	17,918	17,103	1,294
1989	21,074	18,237	18,095	17,311	1,382
1990	21,523	18,744	18,594	17,810	1,532
1991	21,749	18,703	18,532	17,698	1,773
1992	22,132	18,879	18,712	17,840	2,138
1993	22,725	19,209	18,982	18,095	2,350
1994	23,581	19,938	19,710	18,821	2,624
1995	23,743	19,790	19,506	18,598	2,841
1996	24,114	20,084	19,812	18,854	2,937
1997	24,213	20,122	19,865	18,902	2,994
1998	24,108	20,064	19,961	19,024	3,152
1999	23,823	19,915	19,805	18,832	3,586
2000	24,174	20,289	20,198	19,182	3,784 r
2001	24,501 r	20,667 r	20,570 r	19,616 r	3,977
2002	23,977 r	20,020 r	19,921 r	18,964 r	4,015 r
January	2,095 r	1,729 r	1,721 r	1,638 r	365 r
February	1,905 r	1,566 r	1,558 r	1,483 r	314 r
March	2,115 r	1,752 r	1,743 r	1,660 r	329 r
April	1,999 r	1,662 r	1,654 r	1,574 r	317 r
May	2,042 r	1,710 r	1,701 r	1,620 r	328 r
June	1,973 r	1,644 r	1,637 r	1,558 r	310 r
July	2,014 r	1,694 r	1,687 r	1,606 r	345 r
August	2,027	1,692	1,684	1,604	337
September	1,981	1,654	1,647	1,568	326
October	2,044	1,694	1,686	1,605	336
November	1,977	1,630	1,622	1,544	322
December	2,072	1,697	1,690	1,609	367
2003 Total	**24,243**	**20,125**	**20,030**	**19,068**	**3,996**
January	2,095	1,717	1,709	1,627	372
February	1,950	1,595	1,588	1,512	346
March	2,090	1,706	1,698	1,617	348
April	1,999	1,641	1,634	1,555	319
May	2,027	1,664	1,656	1,577	321
June	1,892	1,579	1,571	1,496	324
July	N/A	N/A	N/A	N/A	N/A
August	N/A	N/A	N/A	N/A	N/A
September	N/A	N/A	N/A	N/A	N/A
October	N/A	N/A	N/A	N/A	N/A
November	N/A	N/A	N/A	N/A	N/A
December	N/A	N/A	N/A	N/A	N/A
2004 Total	**12,053**	**9,903**	**9,857**	**9,384**	**2,029**

e Estimated r Revised p Preliminary

* See Table 16 corresponding volumes at 15.025 psia and footnote in Appendix B.

Appendix E

Louisiana Energy Topics

<u>AMERICA'S WETLAND ENERGY CORRIDOR TO THE NATION</u>

<u>Parts 1-4 of this series was published in the last report.</u>

Calumet Refinery 1996

Originally Published in January 2004 Louisiana Energy Facts

AMERICA'S WETLANDS: ENERGY CORRIDOR TO THE NATION

Located in Louisiana's Wetlands Resources, the Henry Hub is America's Natural Gas Energy Portal

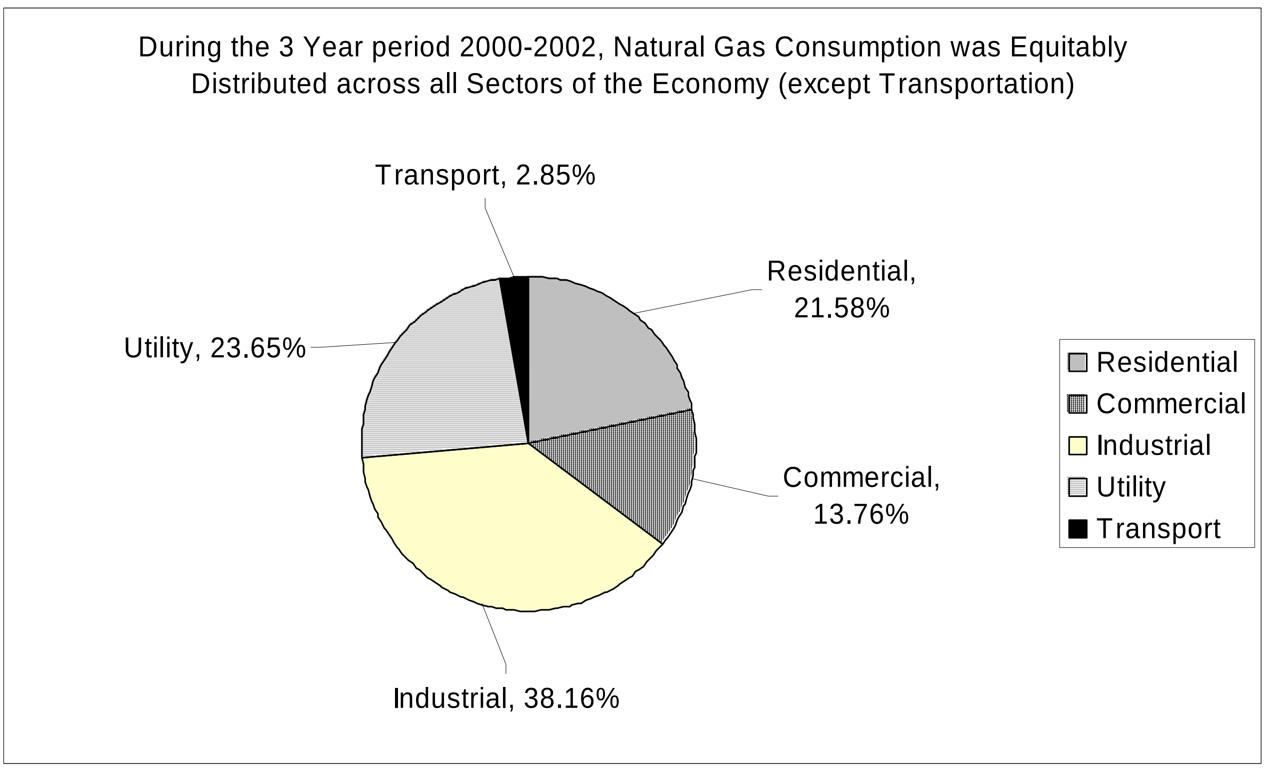
Part 5 of 7

by

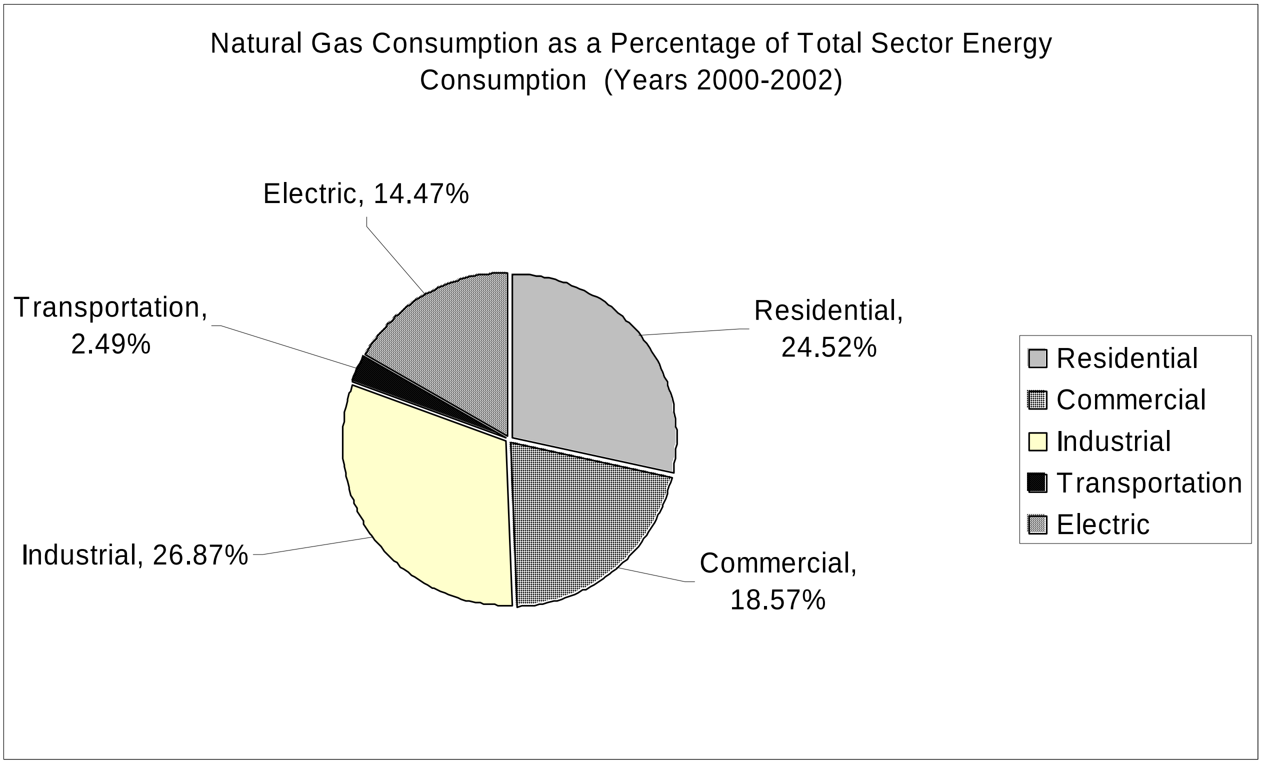
Bob Sprehe, Energy Economist

The Chairman of the Board of Governors of the Federal Reserve System, Dr. Alan Greenspan, recently provided high visibility testimony regarding the critical importance of a dependable supply of natural gas for the nation's economy before the Congress of the United States. Natural Gas provided close to 24% of the nation's energy sources over the 3 year period 2000-2002 (see Part 2 of this 7 part series in Louisiana Energy Facts Annual 2003, Appendix E).

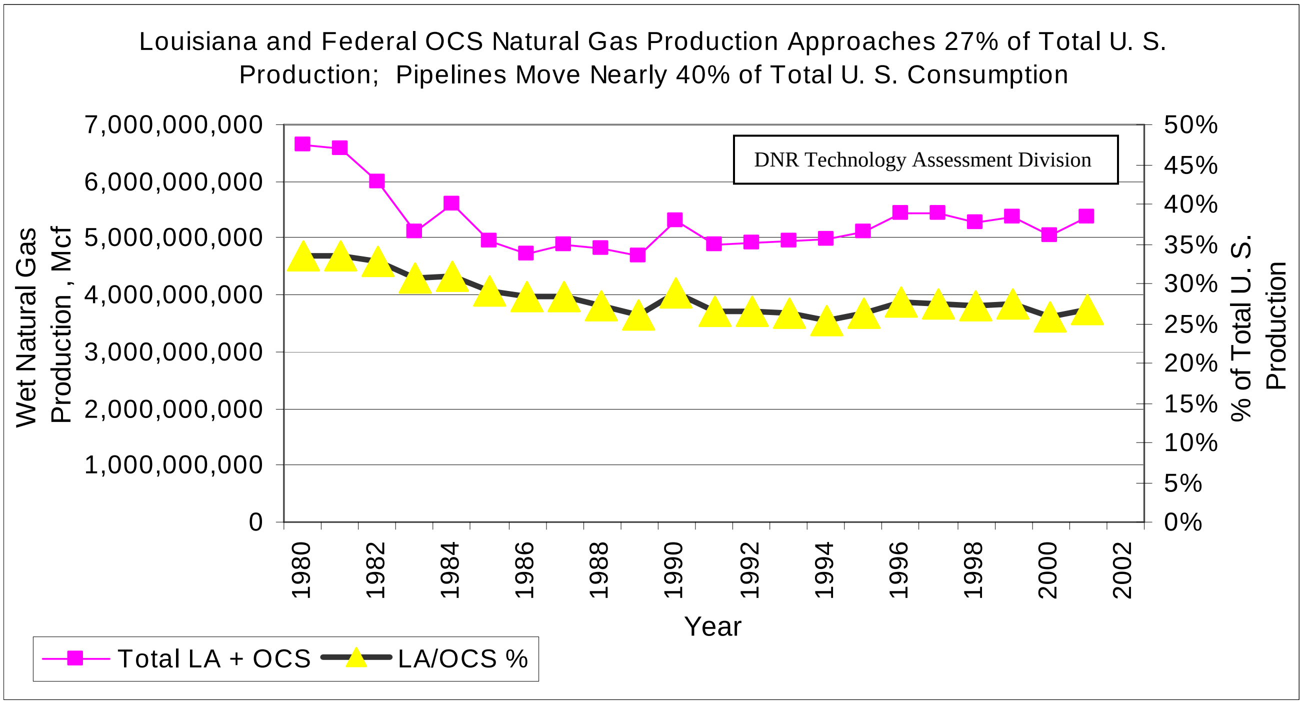
Natural Gas Is Used As A Source Of Energy In All Sectors Of The Economy



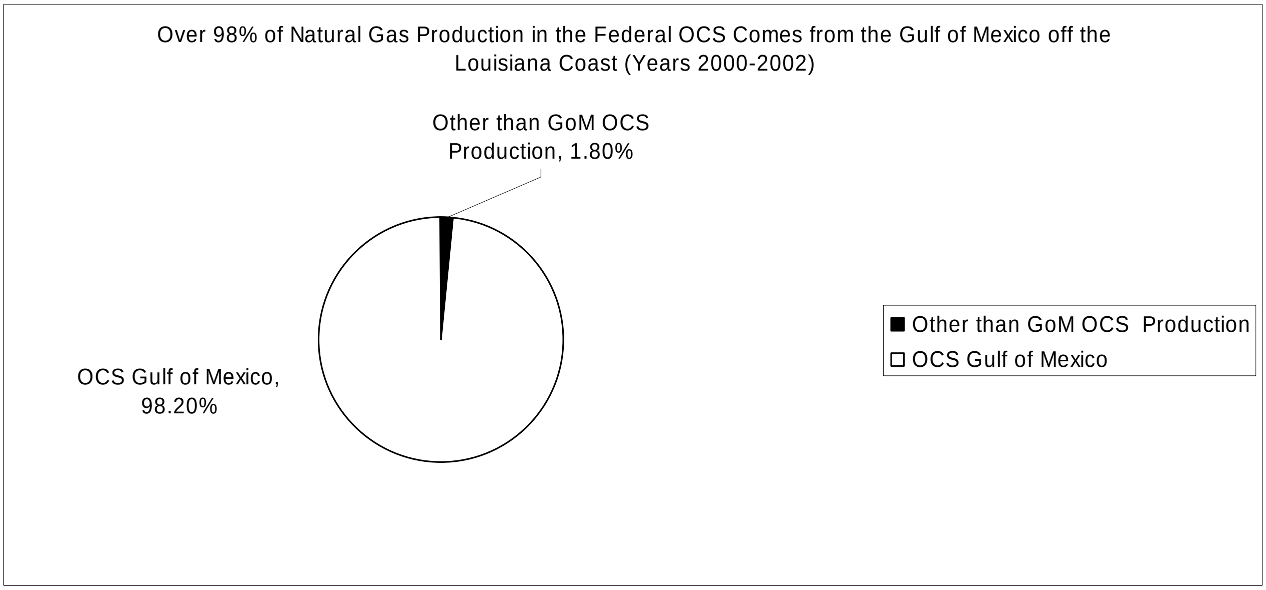
In Each Of These Sectors, Natural Gas Is A Material Source Of Energy (Except For Transportation)



America's Louisiana Wetland Resources Again Provide An Important Energy Portal For Serving The Needs Of The Nation's Citizens And Industry



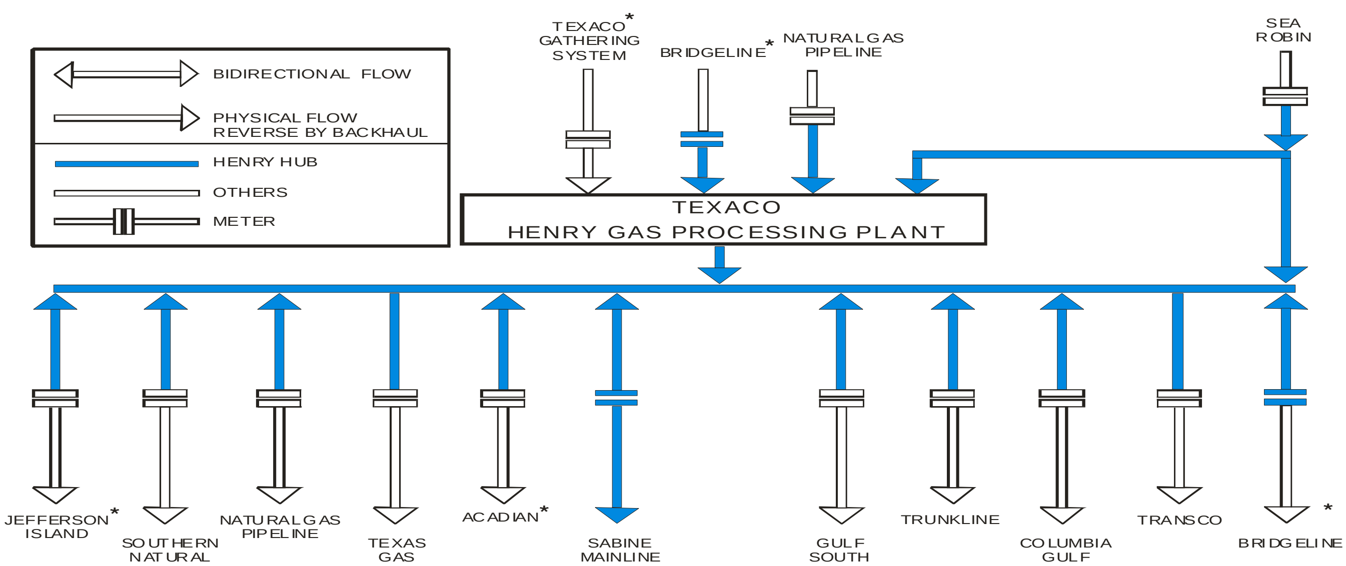
From The Federal Outer Continental Shelf (OCS) In The Gulf Of Mexico Off The Louisiana Coast, Natural Gas Flows Through The State's Wetlands To The Rest Of The United States



America's Wetlands and The Henry Hub

The Henry Hub, owned and operated by Sabine Pipeline LLC, a subsidiary of ChevronTexaco, is located near Erath, Louisiana, in Vermillion Parish. The Henry Hub is the nexus of 13 natural gas pipeline systems that draw supplies from prolific offshore and onshore gas fields in Louisiana and Federal OCS waters. These crucial supplies are then shipped to markets along the East Coast as far North as the New England area, east and west across the Gulf Coast, north into the Midwest, and even up to the Canadian border.

A Schematic Drawing of the Henry Hub



SOURCE: Sabine Pipeline Rev. 4 / 01

*** - Intrastate pipeline**

These 13 pipeline systems include 9 interstate and 4 intrastate lines. Flow capacity through the Henry Hub is approximately 2 billion cubic feet per day (2,000,000 Mcf/day). Completing this nexus is a natural gas processing plant for stripping liquids from the natural gas stream, and 10 billion cubic feet of salt dome cavern storage capacity operated by Bridgeline Holdings L.P., a wholly owned subsidiary of Chevron-Texaco. This combination of facilities, direction of flow throughout the nation, and pure physical volume make the Henry Hub the most vigorous trading point in the North American natural gas market.

America's Wetlands Resources and the New York Mercantile Exchange (NYMEX)

Following a sustained period of years of gradual deregulation, the wellhead price of natural gas became completely deregulated as of January 1, 1993. Market prices for commodities are volatile over time, and natural gas is no different. Therefore, the NYMEX recognized the need for the service of price discovery for producers and consumers of natural gas, a product that is fungible, i.e., interchangeable for purposes of storage and shipment, has a very large number of suppliers and consumers, and experiences a price volatility as demand and supply fluctuate over time, often hourly in response to variations in weather conditions.

In April 1990 NYMEX began offering a standardized contract for trading natural gas futures. A Futures contract is a firm commitment to make or accept delivery of a specified quantity and quality of natural gas during a specific month in the future, at a price agreed upon at the time of the commitment. Traders generally offset their futures contract before contracts mature. In this way, both buyer and seller can lock in their profit/cost from the transaction (i.e., manage their financial risk exposure in a volatile price market). This is done through an Exchange of Futures in Physicals (EFP).

The futures market allows industry participants flexibility in forward planning. This flexibility was further enhanced by the introduction of a natural gas options market in October 1992. The major appeal of an options contract is that the holder of the option is afforded price protection, but still has the ability to participate in favorable market moves (i.e., upward price movements, if a producer for example, above the contracted price of the commodity). The buyer of an option contract does not have any obligation to deliver the commodity. His only up front financial exposure is the cost of the option. Should the market move against the position the only cost incurred is the cost of the option. However, should the price move in the option holders favor, the option has unlimited upside potential.

Futures vs. Options

	Futures	Options
Risk	Unlimited risk on long and short positions	Defined and limited on purchase of puts and calls; unlimited on sale
Price Protection	Establishes fixed price	Establishes floor or ceiling price protection
Margin	Required on long and short positions	Futures style margins for sellers, margin contained in cost of premium for buyers
Hedging	Long, short, spread	Multiple hedging strategies

Source: http://www.nymex.com/jsp/education/option_info.jsp

Taken together, prolific natural gas production both onshore and offshore in Louisiana, multiple pipeline systems delivering natural gas, the large natural gas processing plant for extraction of liquids, and the salt cavern storage facility connected to the site renders the Henry Hub the most viable of major natural gas delivery points in North America and, hence, plays an extraordinarily prominent role in the daily life and financial stability of America's consumers, corporations, and the nation's energy security.

NOTE: The Department of Natural Resources wishes to thank the staff at Chevron-Texaco and Sabine Pipeline LLC for their assistance in reviewing, and constructively contributing to, this article on the Henry Hub. Also, the NYMEX web site, http://www.nymex.com provides a more detailed explanation of Futures markets operations.

Originally Published in February 2004 Louisiana Energy Facts

AMERICA'S WETLANDS: ENERGY CORRIDOR TO THE NATION

Port Fourchon: Serving the Nation's Energy Needs in the 21st Century
Part 6 of 7
by
Bob Sprehe, Energy Economist

Thanks to the foresight of the Louisiana Legislature and members of the Greater Lafourche Port Commission, Port Fourchon strives to continue serving America's energy needs into the 21st Century. When combining Port Fourchon's role as a domestic energy support base with its role in supporting Louisiana Offshore Oil Port (LOOP), this key energy hub is a vital component for nearly 16% - 18% of our nation's oil and gas supply coming just from foreign imports, as well as, current deepwater production in the Gulf of Mexico.

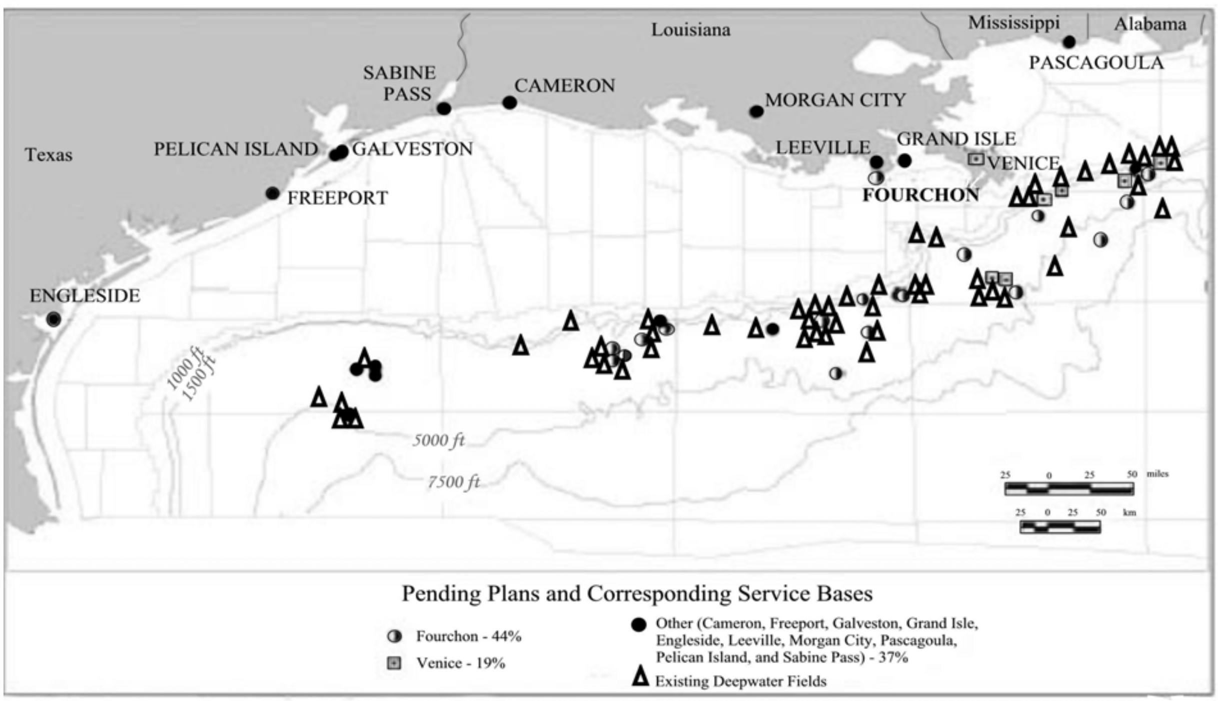
Few people recognize that, as expansive as Coastal Louisiana is, there are only two corridors that provide road access to the Gulf of Mexico, the Lafourche Corridor and another in extreme Southwest Louisiana in the Cameron-Holly Beach area. This limited highway connectivity to the Gulf, and proximity to this nation's major offshore oil and gas fields, has resulted in unprecedented development of Port Fourchon into the premiere intermodal base for support of an increasingly significant amount of this nation's hydrocarbon supply.

History of Port Fourchon
The Greater Lafourche Port Commission was created by Act 222 of the Louisiana Legislature in 1960. The Commission is an elected nine member governing body serving six year terms. Its area of jurisdiction includes the 10th Ward of Lafourche Parish. The Commission has the authority to, (1) regulate commerce and traffic, (2) maintain proper water depths, (3) provide police protection, (4) enact ordinances, (5) levy taxes, (6) issue bonds, and (7) expropriate property.

Through the years, the Commission has pursued an aggressive strategy of expansion to serve the needs of the oil and natural gas exploration, drilling, and production sectors. The expansion of Port Fourchon over the past 40 years has caused it to run out of elevated land area. The Commission built new land by elevating low lands, even open water, with dredge materials. By using this technique, over 700 acres have been developed, with an additional 1,500 acres remaining to be developed.

Located on the Gulf, Port Fourchon serves as the land base for support of LOOP and serves as the intermodal base for support of 75% of the Gulf's domestic deepwater oil and gas production.

In 1995, technological advances in exploration and production, and the passage of the Deepwater Royalty Relief Act (DWRRA) by Congress, resulted in the unleashing of a new frontier in waters greater than 1000 feet deep in the Gulf. This phenomenon has enabled this nation to identify, and begin producing, what has proven to be the largest domestic oil and gas finds ever with reserves estimated at 71 billion barrels. These huge reserves have sparked an unprecedented surge in Federal leasing and lease holder activity. As the industry geared up to harvest these federal resources, it became evident that there was no better place geographically, economically, or environmentally to support this swell of activity than Port Fourchon, Louisiana's southernmost port.



Adapted from MMS: "Deepwater Gulf: America's Expanding Frontier" 2002

Since the passage of DWRRA, the Port has more than tripled in size and activity. Now, Port Fourchon has over 600 acres in operation and another 700 acres in development. Over 150 companies operate out of the port, and intermodal tonnage now exceeds 15 million tons. Over 1000 trucks bring cargo in and out of this key support facility each day.

In the few years since deepwater production began, it has surpassed the Outer Continental Shelf (OCS) in production. Since 1995, deepwater oil production has experienced a 500% increase, and gas a 550% increase. This surge in activity has initiated the evolution of Port Fourchon into the premiere energy intermodal support facility in the Gulf. State of the art deepwater shore base support capabilities, not present anywhere else in the world, exist at Port Fourchon. These capabilities, which allow industry to efficiently support deepwater activity, have played a key role in the success of this nation's domestic production which positively impacts the national balance of trade, growth of our Gross Domestic Product (GDP), and helps provide energy security to consumers.

The U.S Minerals Management Service (MMS) projects that there will be 10-to-21 billion barrels of oil and 40-to-60 trillion cubic feet of natural gas discovered on just the federal leases licensed for development over the next 5 years. That is enough energy to fuel every commercial and private vehicle in America for two-to-five years and heat, cool and run appliances in every home in America for two-to-three years. In order to meet these energy milestones, key energy infrastructure will have to be sustained, and even upgraded.

Leeville Bridge the "weakest link" in the supply chain to Port Fourchon.

LA 1 and Leeville after a minimal Tropical Storm

America's Energy Corridor Highway: Louisiana Highway 1

The "weakest link" in Port Fourchon's ability to fulfill the demands placed upon it is Louisiana Highway One (LA Hwy. 1), Fourchon's only connection to land. This 17-mile stretch of LA Hwy. 1 is a barely-above-sea-level, two-lane roadway that runs through the most rapidly deteriorating estuary system in the world. It provides the ***only*** means of land access to Port Fourchon and Grand Isle, Louisiana's only inhabited barrier island. LA Hwy. 1 is the lifeline of support for the backbone of the nation's oil and gas supply. It transports a quarter of Louisiana's seafood production and is the only means of hurricane evacuation for 7,500 oilfield workers and several thousand residents. LA Hwy. 1's vulnerability to destruction is increasing daily as wetlands erode. Studies have proven that a substantial part of LA Hwy. 1 could be below sea level within 8 years. Additionally, LA Hwy. 1 will continue to deteriorate under heavy truck traffic to Port Fourchon unless new construction and upgrades are quickly implemented.

Efforts are underway to build an elevated four-lane highway from Golden Meadow to Port Fourchon. Environmental clearances have been obtained and engineering is underway, but Federal funding has not been committed. This deteriorating highway system has been used as a glaring example of the huge inequity that exists in offshore revenue sharing between the federal government and the states supporting offshore development.

Currently, the Federal Government shares 50% of its onshore mineral revenues with the state within which the production occurs. Revenue from production beyond 3 miles offshore from a state's boundary is not shared with the state. Without a similar mechanism in place to share offshore revenues with the adjacent states, the ability of key coastal energy infrastructure to sustain the level of support activity being demanded of it is threatened. In 2001, the federal government collected over $5 Billion in oil and gas revenues from offshore Louisiana and shared less than one-half of one-percent with Louisiana. This crucial highway system has been acknowledged as “vital” by the Department of Interior, Minerals Management Service. LA Hwy. 1, now recognized as a critical path in “America’s Energy Corridor”, has been designated by Congress as one of only 44 High Priority Corridors in the nation.

Port Fourchon: Truly the Nexus of America’s Energy Corridor

It took Federal Reserve Board Chairman, Alan Greenspan, to command the attention of our nation’s political leadership on the critical importance of an adequate natural gas deliverability capacity for a vibrant economy. Two (2) new sources of natural gas will now command priority consideration: (1) imported Liquefied Natural Gas (LNG); and (2) deep and ultra deep drilling to depths of up to 35,000 feet sub-sea (or below the seabed as contrasted with deepwater drilling) in the shallower waters of the OCS in the Gulf of Mexico.

In late 2002, ChevronTexaco filed an application with the Coast Guard for an offshore LNG (Liquefied Natural Gas) terminal to be known as “Port Pelican.” Since this announcement, other firms have come forward with announcements for preliminary engineering studies on the location of LNG terminals in the Gulf of Mexico, namely Shell and Freeport McMoran. Port Fourchon’s central location will, again, figure prominently in servicing these LNG terminals and ultra deep drilling on the OCS, and the critical role each will play in meeting the Nation’s energy needs in the 21st Century.

Challenges for America’s Wetlands Port

It is obvious that Port Fourchon and LA Hwy. 1 play a critical role in supplying this nation with a substantial share of its total energy needs. It is projected that Port Fourchon will continue to play an increasingly significant role in supplying the fuel that runs this country for decades into the future. At the same time, it is very clear that the demands placed upon this coastal port strain the existing highway infrastructure, and Mother Nature further exacerbates the problem with rising waters and disappearing wetlands. **There is much at stake for this entire nation if Coastal Louisiana succumbs to the forces of nature.** If we are to meet the challenges of the 21st Century in providing an adequate level of national energy security, and ensure our ability to fuel this country for generations to come, this nation will have to develop a process by which states adjacent to offshore production can sustain and upgrade critical energy infrastructure.

Note: The Department of Natural Resources wishes to thank the Executive Director of Port Fourchon, Ted Falgout, and his staff, and the Louisiana 1 Coalition (LA 1 Coalition) Executive Director, Roy Martin, and his staff, for their contributions to the preparation of Part 6 of this 7 part series. The Port and the LA 1 Coalition have excellent web sites containing further background for those interested at www.portfourchonla.com, and http://la1coalition.org.

Originally Published in April 2004 Louisiana Energy Facts

Louisiana, an Energy Consuming State
An Update Using 2000 Data

Louisiana consumed 3,965.2 trillion BTUs (TBTUs) of energy in 2000, up almost 10% from 1999. This ranks Louisiana seventh in total energy consumption and second in per capita energy consumption among the states. Two-thirds of the increase is attributable to petroleum with all other sources, except hydro-electric, making up the remaining third of the increase. Louisiana's high energy consumption is mainly attributable to the transportation and industrial sectors. These two sectors constitute 86% (23% for transportation, 63% for industrial) of Louisiana's energy consumption.

Within the transportation sector, the consumption of motor gasoline is about average for the U.S., accounting for 30% of Louisiana's transportation energy budget. The bulk of Louisiana's transportation energy comes from the transportation of oil and gas. Louisiana ranks ninth in the U.S. in transportation energy consumption.

The industrial sector is, by far, the largest energy consumer in the state. Louisiana's abundant natural resources have historically meant low energy prices which have attracted energy intensive industries to Louisiana such as chemical, petrochemical, and refining. Louisiana ranks third in the nation, behind Texas and California, in industrial energy consumption.

Louisiana's energy production for the year 2000 increased by 0.8% to 2,623.1 TBTUs. Oil production, in decline since the early 80s, decreased by 3.3%, but was more than offset by an increase of 0.75% in natural gas production. These figures do not include the energy contained in the oil and gas produced in the federal OCS area attributable to Louisiana. Louisiana has no direct control over, nor does it receive any direct revenue benefit from, the production of oil and gas from the OCS area. Louisiana does, however, provide the necessary infrastructure to facilitate the exploration, production, and transportation of oil and gas from the OCS. With the energy from oil and gas production in Louisiana's OCS area included (almost one-fifth of the nation's oil and gas supply), Louisiana produced 9,621 TBTUs of energy in 2000, second in the nation after Texas.

On balance, not counting OCS oil and gas production, Louisiana is a net energy consuming state with 1,342.1 more TBTUs consumed than produced, ranking Louisiana 20th in the nation in net energy consumed and 7th in total energy consumption. The table on the next page provides an energy balance for the state, both with and without Louisiana federal OCS production.

Originally Published in May 2004 Louisiana Energy Facts

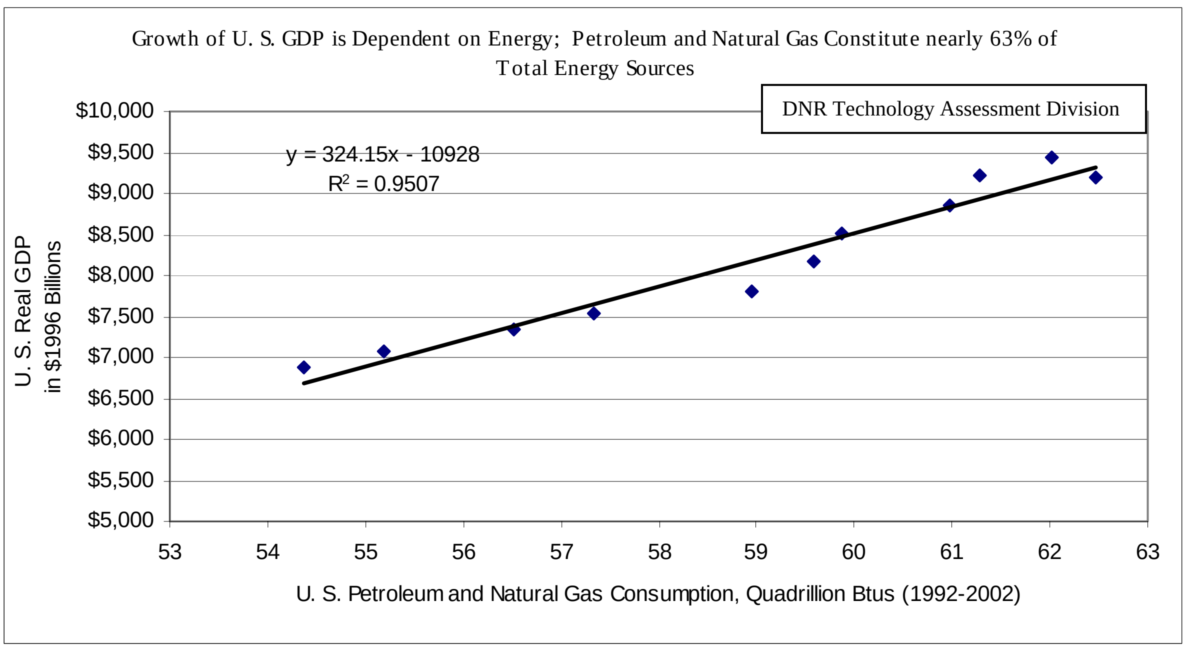
AMERICA'S WETLANDS: ENERGY CORRIDOR TO THE NATION

The Financial Well-Being of America's Consumer is Dependent on the Well-Being of America's Wetlands
Part 7 of 7

by

Bob Sprehe, Energy Economist

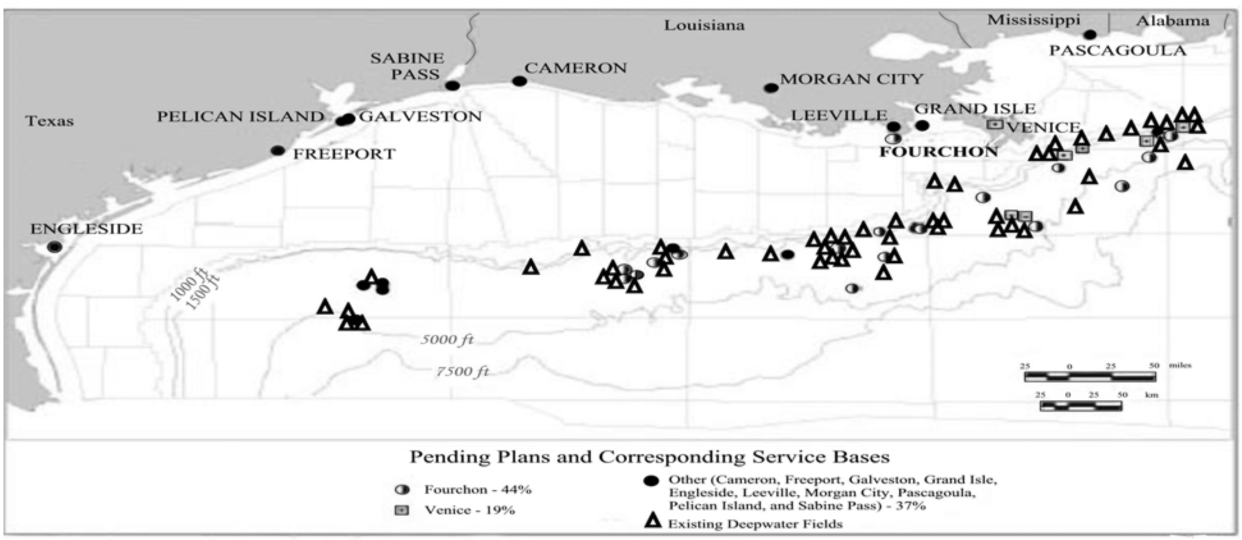
Energy is the lifeblood of the American economy, and America's Wetlands are the main artery. America's economic growth, and, therefore, the economic well-being of America's consumers, depends on access to a stable, secure, and dependable source of energy. America's Wetlands provide such access for nearly 34% of the U. S. natural gas supply and nearly 29% of the U. S. oil supply. Think of the catastrophic economic consequences to the American consumer, and the nation's Gross Domestic Product (GDP), should this volume of energy supply be interrupted!



The Louisiana legislature has worked diligently to ensure the adequacy of the Wetlands oil and natural gas infrastructure. One key element of that infrastructure is Port Fourchon. Port Fourchon services domestic offshore exploration and production on both the Outer Continental Shelf (OCS), in the Deepwater Gulf, and also, the Louisiana Offshore Oil Port (LOOP), the nation's only deepwater oil import terminal.

Louisiana Highway 1 is the only land access to Port Fourchon. LA Hwy. 1, now recognized as a critical path in "America's Energy Corridor," has been designated by Congress as one of only 44 High Priority Corridors in the nation. LA Hwy. 1 is in desperate need of Federal funds for construction of a 17 mile stretch of elevated highway over a vulnerable length of Wetlands to sustain service at America's Energy Port.

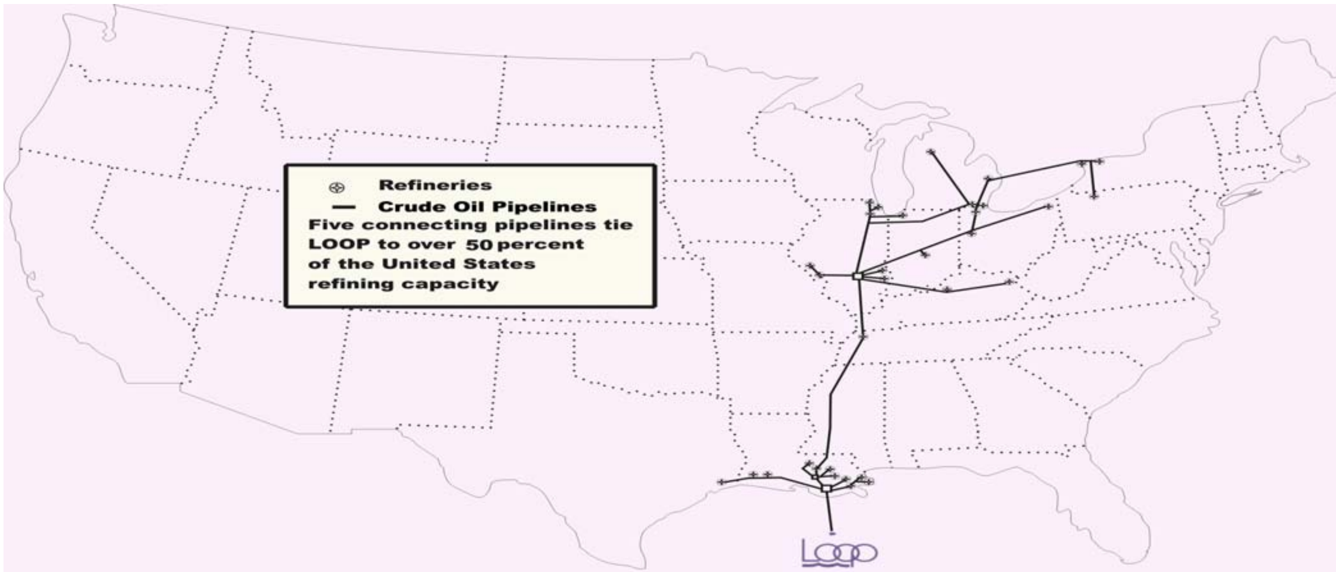
Aerial view of Port Fourchon, America's Energy Port



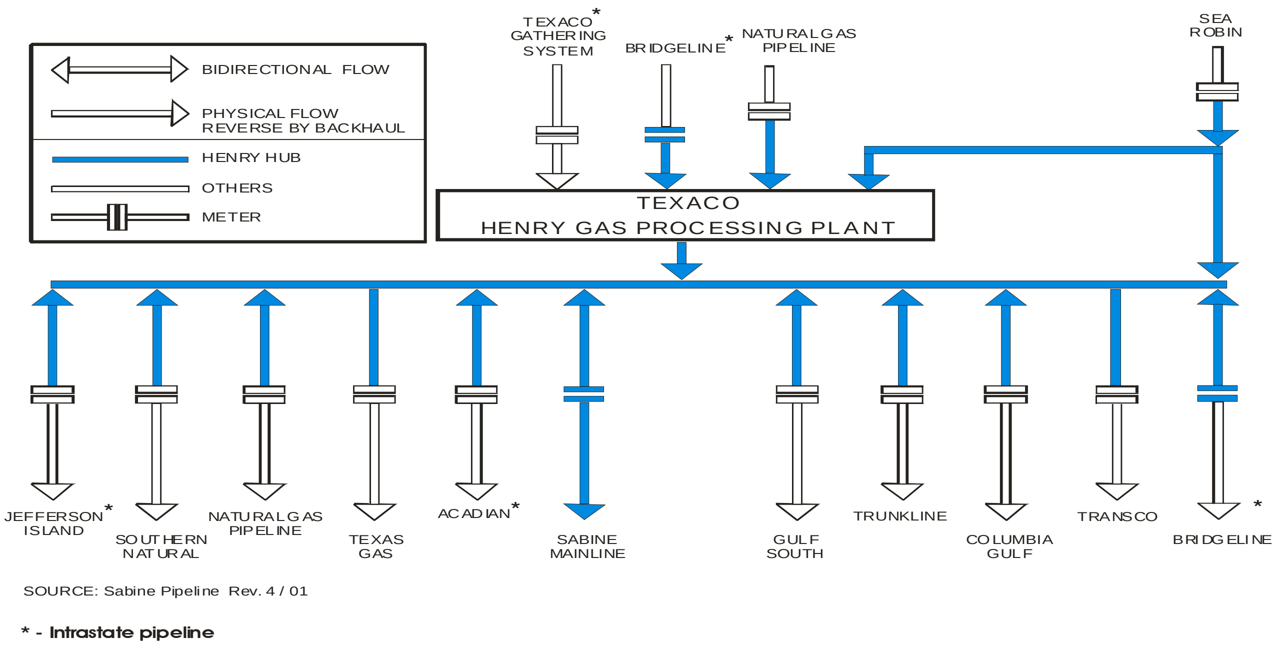
Adapted from MMS: "Deepwater Gulf: America's Expanding Frontier" 2002

The crude oil that flows through the offshore pipelines and LOOP terminal ends up as gasoline in the tanks of consumer automobiles, as home heating oil products, as jet fuel, and as power plant fuel for electric power generation throughout the South, Midwest and Eastern United States.

A large portion of the natural gas that flows from Louisiana fields and the Federal Gulf of Mexico to homes, malls, and power plants around the nation, flows through the vital Henry Hub at Erath, Louisiana. Chevron-Texaco's proposed LNG import terminal in the Gulf of Mexico will flow through the Henry Hub.

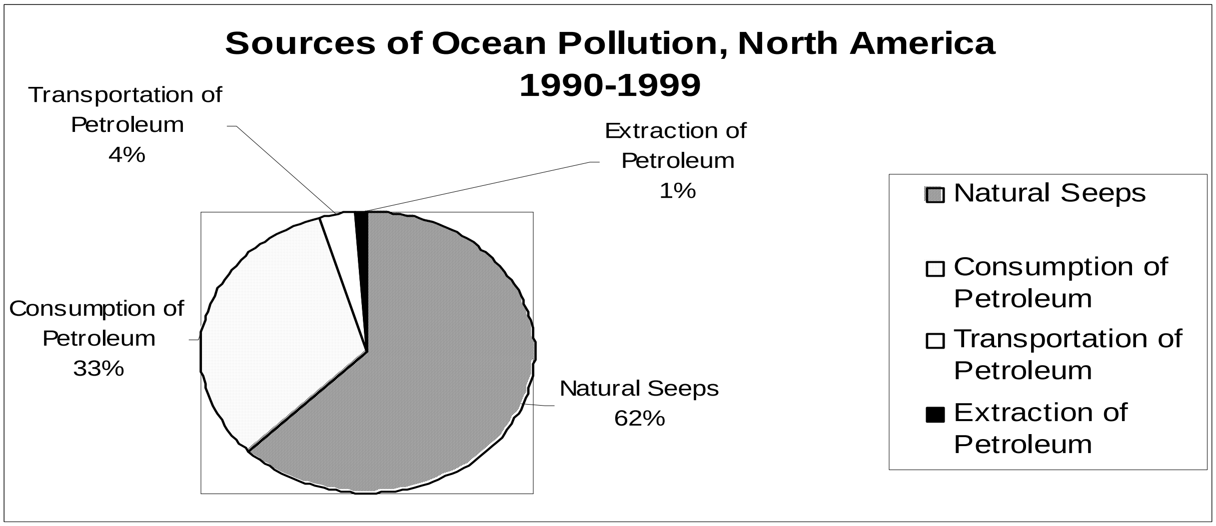


America's Wetlands are the Petroleum Corridor to the Nation



Over the years, and at the direction of the legislature, Louisiana regulatory agencies responsible for oil and natural gas exploration and production operations (notably the Department of Natural Resources and the state's universities) have cooperated with, and assisted, the oil and natural gas sectors in the development of techniques and best practices and with the implementation of new technologies to operate responsibly, co-existing safely with the environment. Much of the know-how developed in Louisiana has been transferred around the world, as offshore oil and natural gas exploration has proliferated globally.

The National Academies Ocean Studies Board Report “Oil in the Seas III”, Copyright 2002, noted “…improved production technology and safety training of personnel have dramatically reduced both blowouts and daily operational spills. Today, accidental spills from platforms represent about one percent of petroleum inputs in North American waters and about three percent worldwide.”



<u>Consumer Well-being</u>

Economists use a general equation to express a nation’s total output, i.e., Gross Domestic Product (GDP).

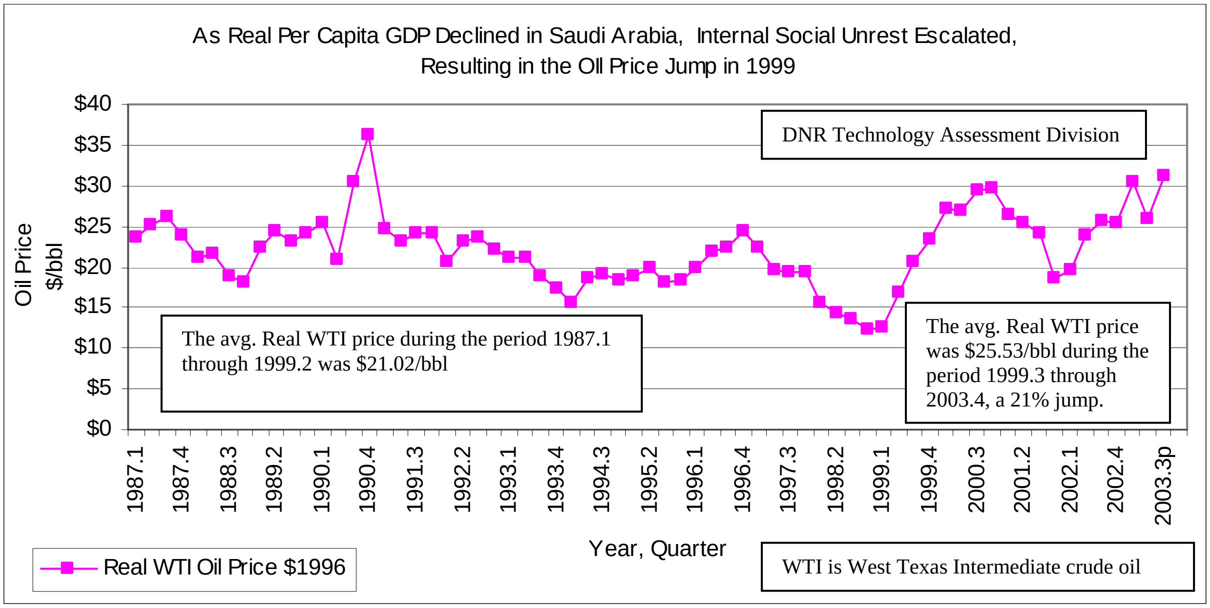
GDP = C + I + G +/- Y

Where C = Consumption
I = Investment
G = Government Expenditures
Y = Exports and/or Imports, net

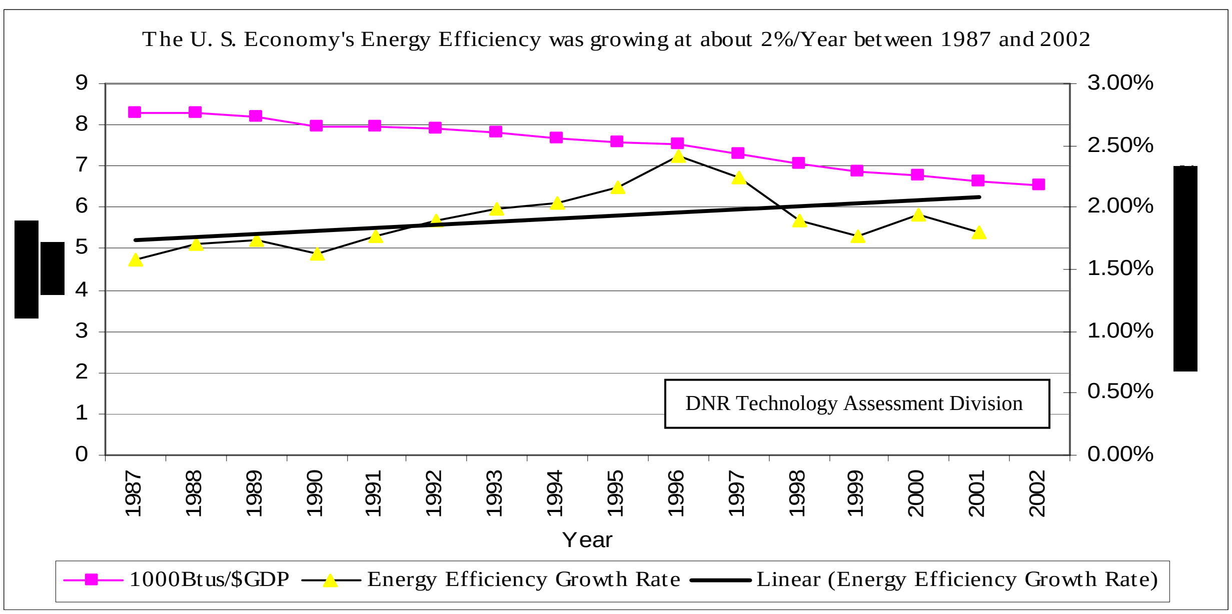
America’s Wetlands serve to sustain the stable, secure, and dependable source of crude oil and natural gas supply that enables America’s economy, and America’s consumers, to leverage their physical and intellectual capabilities. Through this physical and intellectual leverage, America’s GDP can grow, and Americans are able to aspire to rising standards of living.

The price of energy in the economy has a direct effect on the rates of growth of the economy and consumer well-being. Without the supply capability from America’s Wetlands, the price of energy would be even higher than consumers and the economy currently experience.

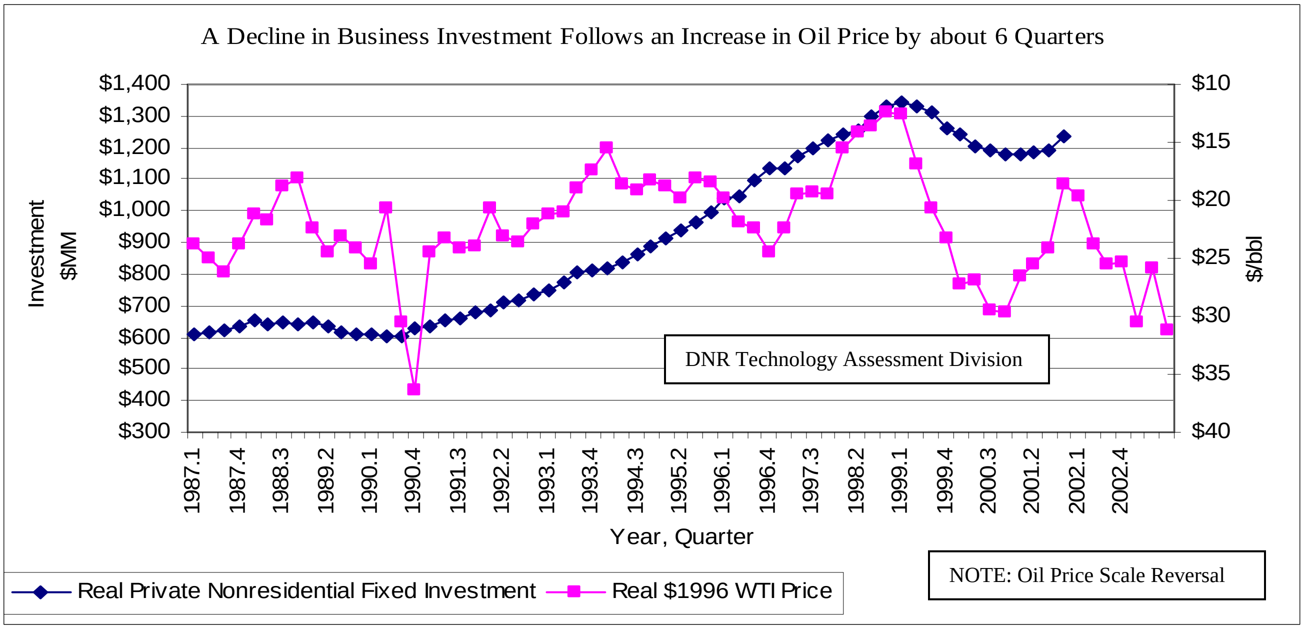
As early as 1999, internal unrest throughout the Middle East, particularly in Saudi Arabia, resulted in OPEC’s agreement to manage oil prices within a range, suggested as $22-28/barrel (bbl).



This almost overnight jump of 21% in oil (energy) prices overwhelmed the energy efficiency of existing plant and equipment. The result: higher operating costs and lower operating profits which cannot be immediately offset without the cash flow for new capital spending on more energy efficient plant, equipment, or energy saving components.

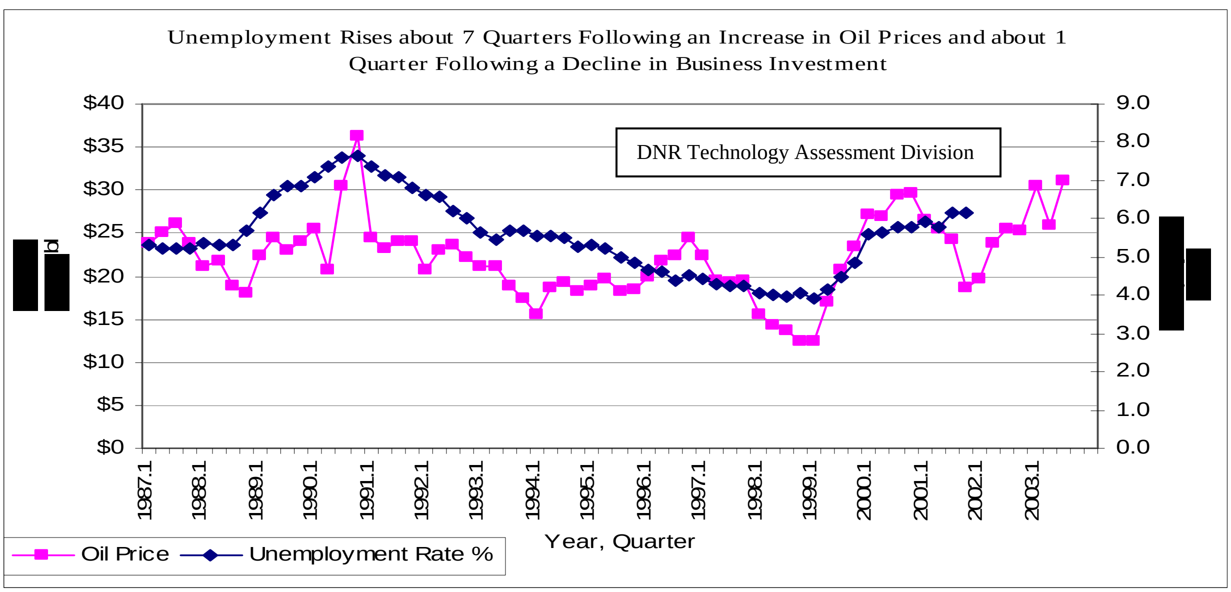


Through America’s Wetlands, however, the nation has a supply source flexibility that does not exist elsewhere. Producers, other than OPEC members, have affordable access to the American consumer through America’s Wetlands, the Nation’s Energy Corridor. The subsequent price jump, as a result of OPEC decisions, would have had an even greater impact on the American economy and America’s consumer had not America’s Wetlands provided such access for the nation’s energy supply. As it was, the sharp jump in oil prices (using oil as a proxy for energy costs) worked its way through the economy, subsequently slowing the rate of growth of business investment.

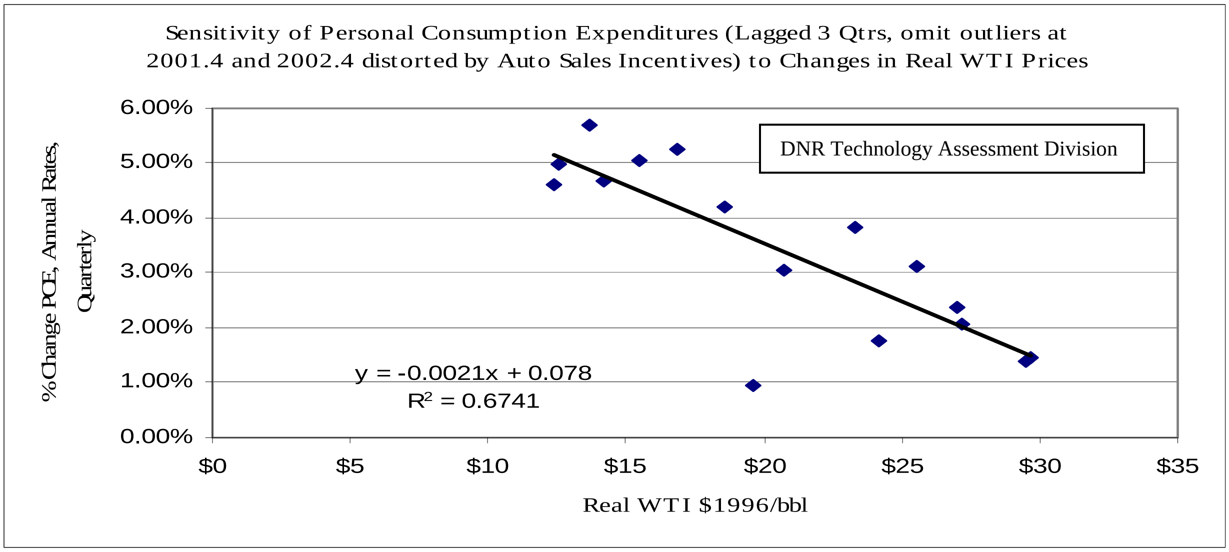


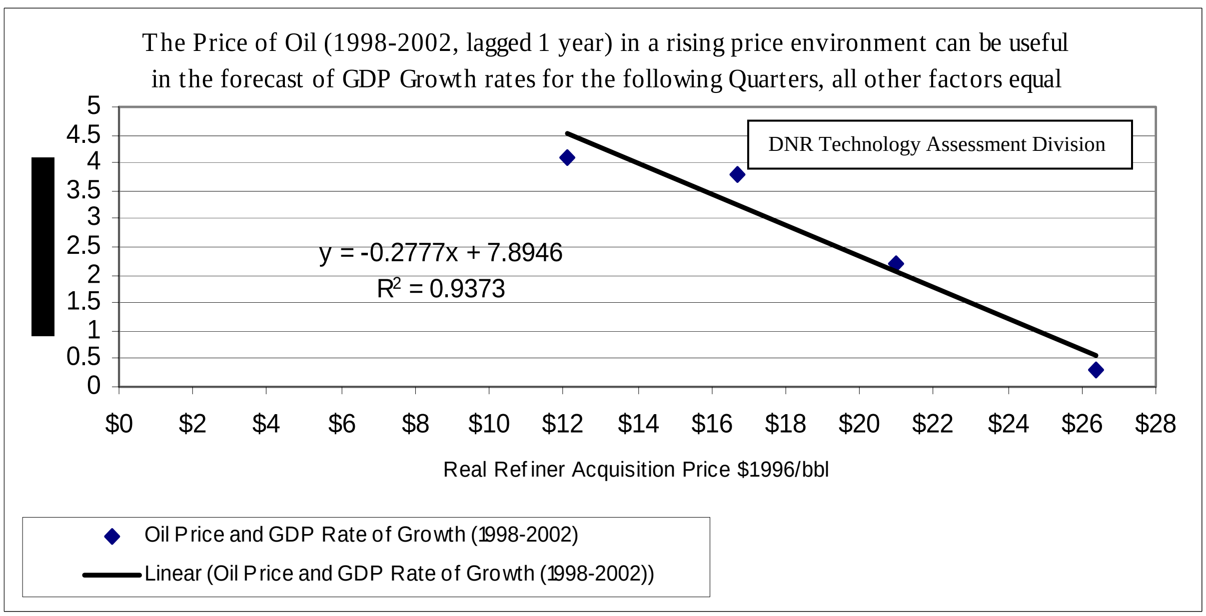
And when business investment fell, the employment levels also declined—resulting in an increase in the unemployment rate.

As the oil price rise affects business conditions, it also impacts the consumer pocketbook. Consumer expenditures begin to decline following an oil price rise.



The result of the oil (energy) price rise, and its impact on the factors in the GDP equation, is a decline in the rate of growth of the nation's GDP, all other things being equal, affecting the economic outlook for America's consumers. To offset this slowdown, federal spending expanded sharply along with deficits. These deficits have stimulated GDP growth rates.

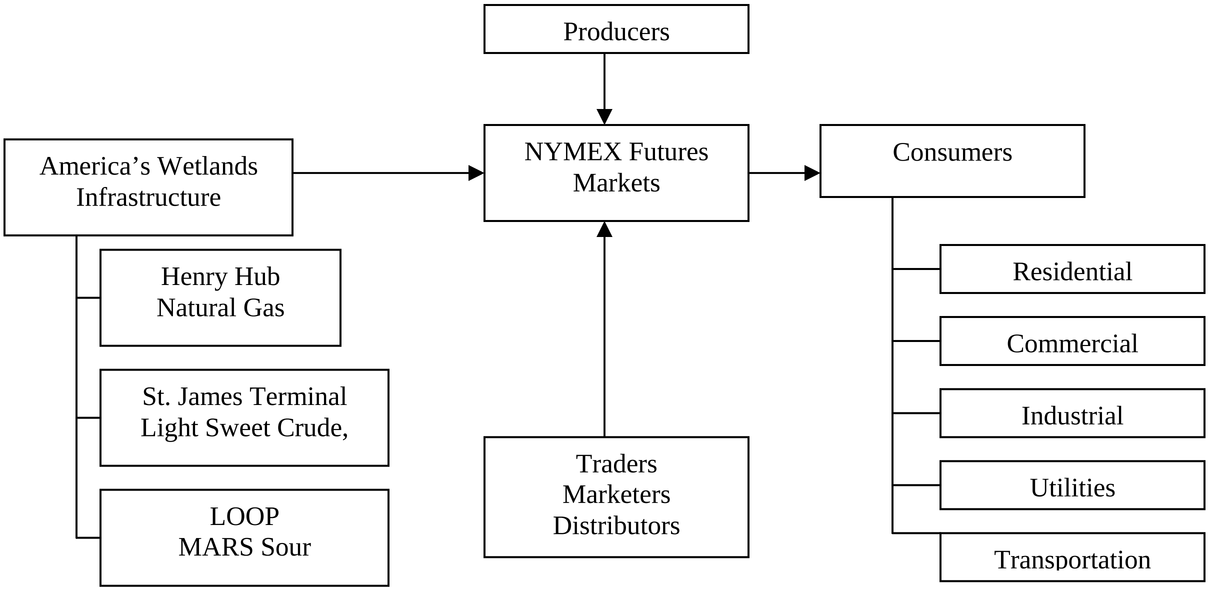




All Americans have a love/hate relationship with Wall Street. We love it when our stock investments rise in value; we hate it when we see evidence of runaway greed at the expense of our pension plan portfolio. However, Wall Street and the New York Mercantile Exchange (NYMEX) love America's Wetlands.

The NYMEX is an integral part of the America's Wetlands infrastructure. Commodity markets base a substantial portion of their futures operations on the Wetlands' oil and natural gas infrastructure creating the price discovery mechanism which ensures the balance between demand and supply, and helps stabilize energy prices for consumers over the longer term.

America’s Wetlands Infrastructure to Consumer Flow Chart



Each of the “big name” investment banks on Wall Street has in-house commodities trading platforms. The average daily trading volume of Henry Hub futures approached $3 billion dollars in 2002. The average daily trading volume of Light Sweet crude oil approached $6 billion dollars in 2002. The combined economic value related to the 3 commodities (light sweet, MARS sour, and Henry Hub natural gas) approaches or exceeds an average of $10 billion dollars per day.

America’s Consumers have an ownership interest in America’s Wetlands. The oil and natural gas infrastructure supported by America’s Wetlands sustains the economic wellbeing of American Consumers. A significant part of that infrastructure is the financial and trading markets of Wall Street. That too is at risk if the “ownership interests” should fail to sustain America’s Wetlands.

America’s Wetlands now need federal financial help to continue their role in securing the economic well-being of the American Consumer. America’s Wetlands need Federal Government funding to stabilize the environmental losses of an encroaching Gulf of Mexico—losses which threaten the stability, security, and dependability of the Nation’s Energy Corridor.

All citizens of Louisiana ask for the help of America’s Consumers in the need to secure $14 billion in funding to save America’s Wetlands, the Nation’s Energy Corridor. Our federal legislators have funded efforts to save Florida’s Everglades and the Iraqi Wetlands. It is our fervent hope that America’s Consumers will urgently speak out in their best interest and help Louisiana continue to serve the energy needs of the nation, securely, dependably, and stably.

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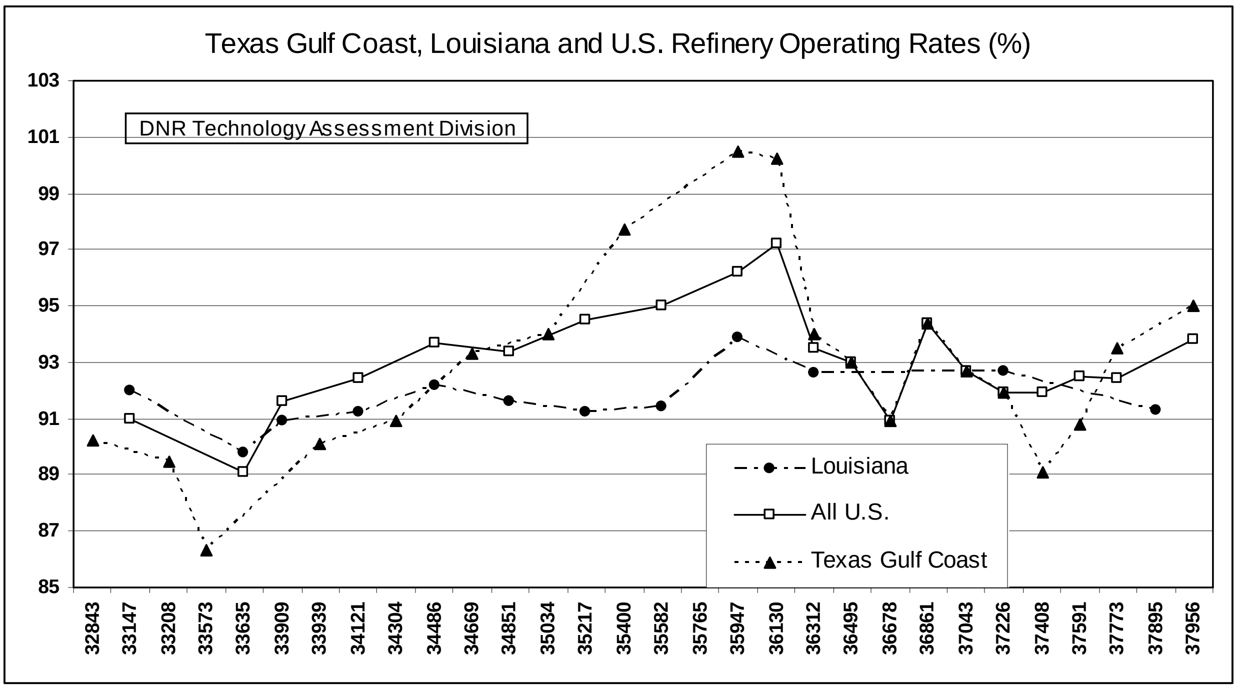
2003 Louisiana Crude Oil Refinery Survey Report

Report Highlights

Louisiana refinery capacity shrank slightly from our last survey. Most refineries showed increased capacity, but were overshadowed by the shutdown of American International's refinery in Lake Charles. The current operating capacity is 2,734,070 barrels per calendar day. The Louisiana refinery operating rate was 91.3% for this survey period. The total U.S. refinery operating rate was 92.3% for the same period. The following figure shows the Texas gulf coast, Louisiana, and the total U.S. refinery operating rates since 1989.



Note: Data points generally represent 6-month or 12-month averages
Source: LA Refineries: LA DNR, Technology Assessment Division *Louisiana Crude Oil Refinery Survey Report 2003*
TX & U.S. Refineries: EIA, *Petroleum Supply Annual*, Vol. 1 & 2

Gulf coast refineries experienced a rebound in profit margins in 2003, from $2.02 per barrel in 2002 to $3.23 per barrel in 2003, as reported by Muse, Stancil & Co. in the Dec. 22, 2003 edition of the *Oil & Gas Journal*.
Changes since our last survey include Valero's acquisition of the Orion refinery in Norco, and the merger between Conoco and Phillips Petroleum.

EIA statistics show that, after declining in 2001, overall petroleum product demand increased to slightly over 20 million barrels per day. Finished motor gasoline supply rose 1% in 2003 to 8.94 million barrels per day, and jet fuel continued its two year decline, down 2.5% to 1.57 million barrels per day.

Gasoline remains the largest share of refinery production in Louisiana at about 40% of the total. The following table lists the top ten refinery products based on percent of total refinery production.

Product	Percent of Refinery Products
Regular gasoline	27.0
Diesel	17.8
Jet fuel/Kerosene	10.3
Premium gasoline	8.0
Residual/Coke	6.3
Fuel oil	6.1
Reformed gasoline	4.6
LPG	4.2
Petrochemical feed	4.1

Source: Department of Natural Resources, Technology Assessment Division
Louisiana Crude Oil Refinery Survey Report 2003

Five refineries in Louisiana produced reformulated gasoline (RFG) during this survey period. Approximately 12% of the gasoline produced was RFG. In the U.S., about 33% of gasoline produced is RFG. A chart showing areas of the country that are required to use RFG can be seen on the EPA's website at: http://www.epa.gov/otaq/rfgmap.jpg. Currently, no RFG is used in Louisiana, but that is about to change. The EPA has, recently, downgraded the five parish area surrounding Baton Rouge from "serious" to "severe" for ground-level ozone. The Clean Air Act of 1990 requires the use of RFG in any area classified as "severe". This requirement is set to take effect on June 23, 2004, but lawsuits and/or federal energy legislation may delay or negate the requirement. Even if the requirement is waived, refiners have already geared up to deliver RFG to the five parish area and would need time to revert back. Ozone, or smog, is produced when oxides of nitrogen (NOx) and volatile organic compounds (VOCs) react with sunlight. It has been reported that only16.8% of NOx and 14% of VOCs comes from mobile sources, so requiring the use of RFG in the Baton Rouge area would do little to alleviate the high ozone levels.

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SELECTED LOUISIANA ENERGY STATISTICS

Among the 50 states, Louisiana's rankings (in 2003 unless otherwise indicated) were:

PRIMARY ENERGY PRODUCTION
(Including Louisiana OCS)
1st in crude oil
2nd in natural gas
2nd in total energy

REFINING AND PETROCHEMICALS
2nd in refining capacity
2nd in primary petrochemical production

PRIMARY ENERGY PRODUCTION
(Excluding Louisiana OCS)
5th in natural gas
4th in crude oil
8th in total energy

ENERGY CONSUMPTION (2002)
3rd in industrial energy
2nd in per capita energy
3rd in natural gas
5th in petroleum
7th in total energy
22nd in residential energy

PRODUCTION

State controlled (i.e., excluding OCS) natural gas production peaked at 5.6 TCF per year in 1970, declined to 1.5 TCF in 1995, and rebounded 4.5% to 1.6 TCF in 1996. The 2001 gas production was, approximately, 1.50 TCF, the 2002 production was around 1.36 TCF, and the 2003 gas production was 1.32 TCF.

State controlled gas production is on a long term decline rate of 4.2% per year, though the current short term (2004-2008) forecast decline is around 5.7% per year.

State controlled crude oil and condensate production peaked at 566 million barrels per year in 1970, declined to 127 million barrels in 1994, recovered to 129 million barrels in 1996, and declined to 90.1 million barrels in 2003.

State controlled crude oil production is on a long term decline rate of 4.3% per year, though the current short term (2004-2008) forecast decline is around 4.4% per year. If oil stays around $27.00 per barrel, the decline will remain as predicted. If the price holds consistently above $27.00 per barrel, the decline rate may be lower.

(Continued on the back)

Louisiana OCS* (federal) territory is the most extensively developed and matured OCS territory in the US.

Louisiana OCS territory has produced 90.1% of the 14.0 billion barrels of crude oil and condensate and 82.5% of the 147 TCF of natural gas extracted from all federal OCS territories from the beginning of time through the end of 2002.

Louisiana OCS gas production peaked at 4.16 TCF per year in 1979, declined to 3.0 TCF in 1989, and increased to 3.85 TCF in 2002.

Louisiana OCS crude oil and condensate production first peaked at 388 million barrels per year in 1972 and declined to 246 million barrels in 1989. In this decade, the production has steadily risen from 264 million barrels in 1990 to 528 million barrels in 2002 due to the development of deep water drilling.

REVENUE

At the peak of Fiscal Year (FY) 1981/82, oil and gas revenues from severance, royalties, and bonuses amounted to $1.6 billion, or 41% of total state taxes, licenses and fees. For FY 2003/04, these revenues are estimated to be in the vicinity of $930 million, or about 11.2% of total estimated taxes, licenses, and fees.

At constant production, the State Treasury gains or loses about $15 million of direct revenue from oil severance taxes and royalty payments for every $1 per barrel change in oil prices. This figure rises to $20 to $25 million per dollar change when indirect revenue impacts are included (e.g., income tax, sales tax, etc.).

DRILLING ACTIVITY

Drilling permits issued on state controlled territory peaked at 7,631 permits in 1984 and declined to a low of 1,017 permits in 1999. In 2002 drilling permits fell to 1,025 permits issued, and in 2003 drilling permits rebounded to 1,264.

The average active rotary rig count for Louisiana, excluding OCS, reached a high of 386 rigs in 1981 and reached a low of 64 rigs in 1993. In 2000 the average was 69 active rigs, in 2001 it recovered to 108 active rigs, and in 2003 the average stayed at 2002 levels of 76 active rotary rigs.

The 2003 average active rotary rig count for Louisiana OCS was 81 active rigs, 6 rigs, or 7.4% lower than 2002 average, and the highest active rotary rig count was 107 rigs recorded in 2000. In 1999, the average active rig count was 76 or 16.6% lower than the 1998 average active rotary rigs.

* Note: Louisiana OCS or Outer Continental Shelf is federal offshore territory adjacent to Louisiana’s coast beyond the three mile limit of the state's offshore boundary.

TCF= trillion cubic feet

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DECONSTRUCTING THE MEANING OF RIG COUNT

by

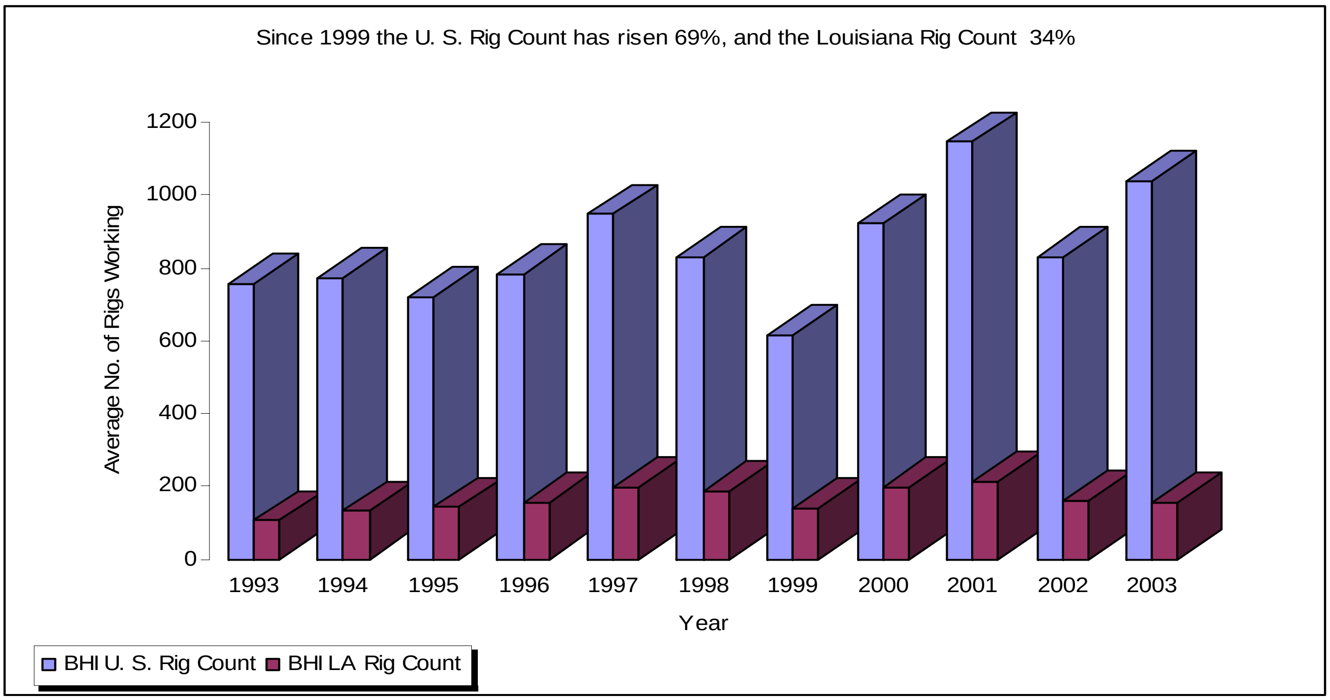
Bob Sprehe, Energy Economist

Rig count is the single most visible indicator of economic activity in the oil and natural gas sector. The number by itself is often misinterpreted. The economic implications of such technical factors as well depth, geologic location, subsurface pressure regime, well cost, federal and state tax incentives, and "hot" oil and natural gas plays affect rig count. Deconstruction of the rig count number, along with use of a new metric, barrels oil equivalent (BOE) discovery rate per rig per year should aid in understanding the meaning rig count and the significance of the relative rate of change of rig count by state or region.

Rig Count

Uses of the rig count metric are diverse. For example, Wall Street analysts use this number in their profit projections for oil service companies. State legislators use this number to assess whether their drilling incentive programs remain competitive with other states. So, when the general economy is reported to be in recovery, yet the Louisiana rig count rate of growth lags the national rig count growth rate, the question arises: "Should we be doing more?"

A Perspective on the Level of Drilling Rig Activity 1993-2003 (1999 was the period low point)



Source: Baker Hughes International (BHI) Rig Count, annual average of month end counts, 1993-2003

The Implications of Rig Count

Unfortunately, the single number rig count is subject to "spin." More often than not, in neither of the above cases, i.e., Wall Street analysts or State legislators, is there precision in the meaning inferred.

The meaning of rig count is complicated. Rigs drill wells. Wells are drilled with rigs matched to a depth capacity. The greater the depth, the greater the cost incurred. The greater the cost incurred, the greater the financial risk exposure for the operator. The greater the financial risk exposure, the less favorable is the market valuation of a public company (at least at this time in the market). The less favorable the market valuation, the less risk will be undertaken by public companies. The less financial risk undertaken, the smaller the oil and natural gas reserve discoveries. The smaller the reserve discoveries, the lower the domestic oil and natural gas production capacity. The lower the domestic production capacity, the greater the reliance on imports of crude oil and natural gas. The greater the reliance on imports, the greater the energy security risk to the economy (just look at the consequences from the supply boat collision at the mouth of the Mississippi River, week of February 21, 2004.)

The greater the energy security risk, the greater the call for energy efficiency. The greater the cry for energy efficiency, the more rapidly the need for capital spending on energy efficient equipment. The higher the capital spending need, the greater the need for profits and cash flow. The greater the need for profits and cash flow, the greater the need for cost cutting. The greater the need becomes for cost cutting, the higher the job losses and "off shoring." And so it goes, like ripples from a pebble dropped in water.

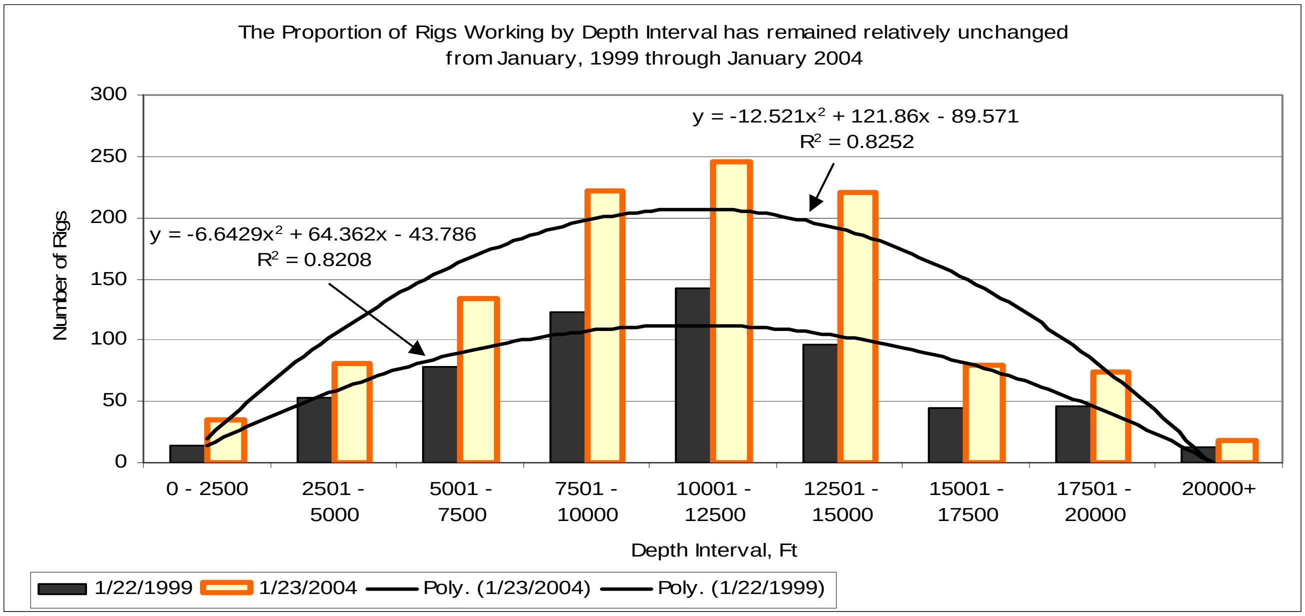
Louisiana has suffered from job losses; particularly those related to energy. Governor Blanco has made job growth her number one priority. Louisiana offers tax incentives to oil and natural gas producers to stimulate investment in drilling and production within the state. From a future production viewpoint, Louisiana is a natural gas state. It has deep (15,000 ft. to 24,999 ft.), and ultra-deep (greater than 25,000 ft.), natural gas reserves. These wells are risky and costly. Is deep and ultra-deep drilling beyond the financial capacity of the remaining oil and gas firms in the state? Are multiple numbers of these deep and ultra-deep wells beyond the financial capacity of even the largest of the major energy firms? Is it proper use of state taxpayer funds to subsidize Wall Street investment banks because of their biases? Is it proper use of state taxpayer funds to subsidize Federal Government tax revenues by granting state subsidies to drilling and production within the state?

If the coalbed methane producers can unite to gain a federal tax incentive, why cannot deep and ultra-deep gas producing states present their case to the Congress for inclusion with the coalbed methane incentive renewal? Is there a political will to undertake this deep and ultra-deep natural gas initiative with the same patience and persistence used by the coalbed methane state political forces? Is this issue of drilling activity more a public relations and public information challenge than a state incentives program challenge?

Deconstructing Rig Count Data

Crude oil and natural gas prices began a sustained rise in 1999. The number of active rigs has increased nearly 69% nationally, and nearly 34% in Louisiana, since that year.

Besides BHI, there is a second source of rig count data. Smith International provides a weekly count of rigs by depth rating. As the rig count has grown, the profile of depth brackets has hardly changed. The largest number of active rigs is in the 7,500 - 15,000 foot depth brackets.



Source: Smith International Rig Count

Between January 1999 and January 2004, the number of rigs working increased by 499 (BHI rig count). Citing only the areas with double digit gains, this gain in rig count occurred as follows:

Geographic Regions Experiencing Significant Rig Count Gain

State/Zone Rig Gain Rank	Rig Gain
Oklahoma	81
Texas RR # 5	42
New Mexico	38
Wyoming	37
Texas RR # 6	37
Texas RR # 8	36
Colorado	35
Texas RR #7C	21
North Louisiana	**19**
Texas RR # 2	15
Utah	13
Texas RR # 9	13
Montana	12
13 States/Zones with double digit gains in rig count	399 (of 499 gain)
by Comparison	
South Louisiana (land)	0
Louisiana Inland Waters	-2
Louisiana Offshore (federal and state)	-6
Total Louisiana	**11**

The state of Louisiana had a rig count gain of 11 between these two periods. Within the state, there were gains and losses; losses included the inland waters and state and federal offshore. North Louisiana land drilling was among the double digit gains. South Louisiana land drilling held steady. **So it would not**

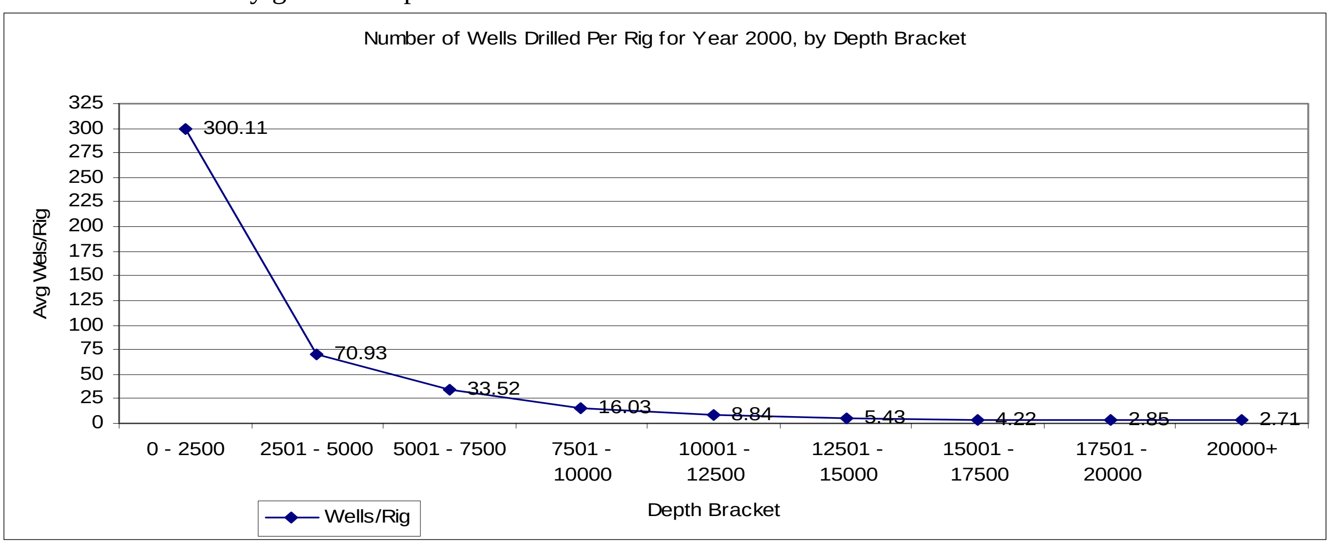
appear that existing Louisiana tax subsidies, or the lack thereof, are the controlling factor in the level of drilling rig activity vis à vis other states.

What might be more controlling are well cost and discovery/cost relationships. Virtually all of the expansion in the active rig count was targeted for natural gas drilling and was on land. (Note: The two sources of rig count data, i.e., Smith and BHI, do not precisely coincide. The data are in closer agreement today than it has been in past years.)

Comparison of Rig Counts,
Smith International and Baker Hughes International

	1/22/1999	1/23/2004	Change
Oil Rigs	122	137	15
Gas Rigs	465	946	481
Offshore	105	99	-6
Source: BHI			
Inland (water)	14	27	13
Land	501	993	492
Offshore	88	89	1
Source: Smith			

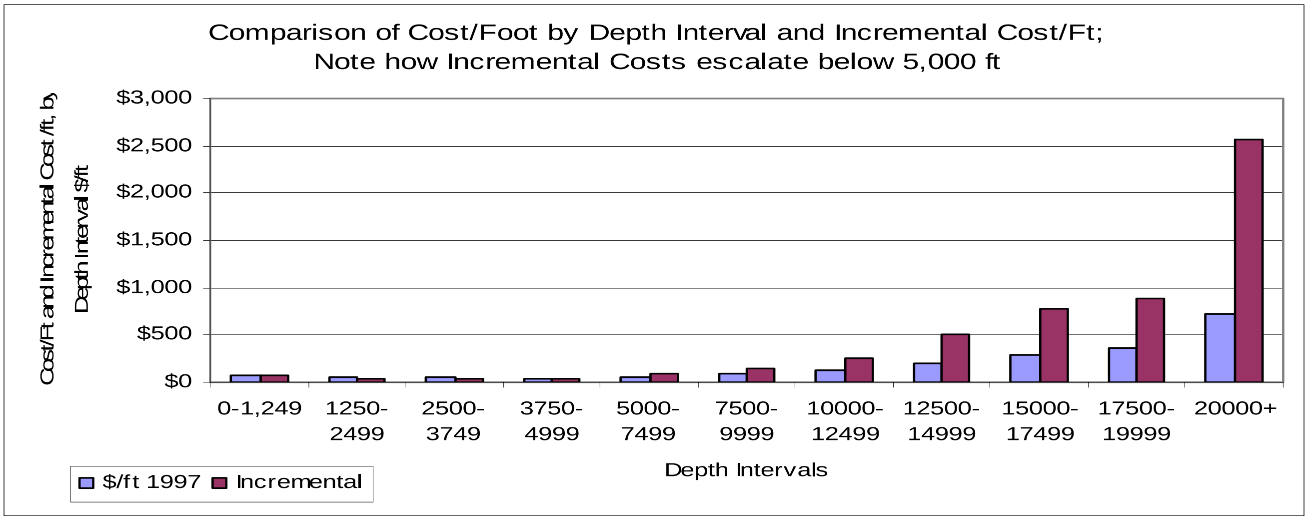
Rates of drilling penetration slow as well depths increase. Thus shallower working rigs can drill a larger number of wells in any given time period.



Source: Joint Association Survey on 2000 Drilling Costs and Smith International Rig Count

Well Cost Metrics

The cost of drilling escalates with depth, both the average cost per foot to a total depth, and the incremental cost per incremental foot of hole drilled. It is logical that companies seek first to exploit those reserves that are less costly which offer lower financial risk exposure, yet afford a return on investment from the size of the reservoir discovered**. A**lso, the larger the firm and the greater the need to replace oil and natural gas production, the greater the need to undertake drilling for larger reservoirs which are associated with increasing depth in a mature drilling province (e.g. the United States, in particular, Louisiana and the Federal Gulf of Mexico).



Looking at the 13 states/zones with double digit gains in rig count between January 1999 and January 2004, the average well costs by depth bracket for the year 2000 are ranked by escalating cost. This data provide some insight into the relative financial risk associated with each area. **In the table below the dollar figure indicates average well cost to that depth bracket in thousands of dollars; the numbers in parentheses refer to wells drilled to that depth bracket during the year 2000.**

A Ranking of the Escalating Cost of Drilling by Province

10,000 - 12,499	Zone	12,500 - 14,999	Zone	15,000 - 17,499	Zone	17,500 - 19,999	Zone	20,000 +	Zone
$677 (1)	CO	$1,099 (1)	CO	$2,254 (23)	OK	$3,381 (1)	E. NM	$5,216 (2)	OK
$752 (127)	TX #8	$1,460 (75)	E. NM	$2,279 (2)	MT	$3,575 (16)	OK	$10,278 (3)	TX #8
$971 (108)	E. NM	$1,530 (18)	MT	$3,500 (4)	E. NM	$5,355 (13)	TX #8	$16,294 (1)	WY
$1,100 (232)	TX #6	$1,627 (160)	OK	$3,643 (28)	TX #8	$5,899 (2)	TX #2		
$1,118 (191)	OK	$1,662 (158)	TX #5	$3,846 (1)	TX #7C	$7,115 (2)	TX #5		
$1,121 (9)	MT	$1,782 (14)	TX #8	$4,029 (10)	WY	$10,094 (4)	WY		
$1,123 (21)	TX #7C	$1,784 (48)	WY	$4,386 (23)	TX #2				
$1,218 (190)	WY	$2,217 (13)	TX #6	$4,470 (7)	TX #5				
$1,234 (77)	**No. LA**	$2,653 (5)	UT	$4,864 (2)	UT				
$1,254 (81)	TX #5	$2,889 (51)	TX #2	**$5,727 (1)**	**No. LA**				
$1,695 (44)	TX #2	$2,905 (6)	TX #7C	$5,906 (2)	TX #6				
$1,978 (18)	UT	**$3,384 (11)**	**No. LA**						
$2,630 (2)	TX #9								
Comparison		**Comparison**		**Comparison**		**Comparison**		**Comparison**	
$2,359 (100)	**So. LA**	**$3,480 (55)**	**So. LA**	**$5,246 (35)**	**So. LA**	**$6,676 (21)**	**So.LA**	**$11,892 (7)**	**So.LA**
$5,724 (118)	**O/SLA**	**$7,159 (82)**	**O/SLA**	**$9,797 (29)**	**O/SLA**	**$13,297 (5)**	**TXO/S**	**$18,853 (2)**	**O/SLA**
$5,966 (20)	TXO/S	$8,225 (17)	TXO/S	$10,974 (4)	TXO/S	$14,015 (11)	O/SLA	$27,105 (14)	FGoM
$8,037 (20)	FGoM	$12,452 (20)	FGoM	$15,125 (30)	FGoM	$17,534 (13)	FGoM		

Source: Joint Association Survey on 2000 Drilling Costs
Average Drilling cost per Well, by depth bracket in $000; numbers in parentheses are wells drilled by depth bracket

Abbreviations used
O/S LA offshore Louisiana (state waters)
TX O/S Texas offshore
FGoM Federal Gulf of Mexico

The Discovery Ratio

It is customary to think in terms of reserves per well. Because rig count is being examined, a new metric is necessary. The new metric compares barrels oil equivalent (BOE) of discoveries per rig per year for the 13 double-digit rig count gaining areas during the period 2000-2002. A comparison with Louisiana is provided.

The rig count used is the total number of active rigs from BHI over a three year period from 2000-2002. The state/zone reserve data is from the Energy Information Administration (EIA) for the same three year period. Only discoveries made through drilling, i.e., of new reserves and extensions to existing fields, excluding acquisitions, were used in the computation. Reserve data for crude oil, natural gas, and natural gas liquids (NGL) were tallied. Natural gas was converted to BOE using the ratio of 1,027,000 btus/Mcf (thousand cubic feet) and 5,800,000 btus per barrel of crude oil (0.177069 BOE/Mcf).

Ranking the Discovery Ride per Year per Active Drilling Rig per Year (2000 – 2002)

State/Zone Rig Gain Rank	Rig Gain	BOE/ Rig/Year	Rank
Oklahoma	81	754,607	11
Texas RR # 5	42	1,023,166	8
New Mexico	38	1,639,102	5
Wyoming	37	4,915,942	1
Texas RR # 6	37	748,691	12
Texas RR # 8	36	785,913	9
Colorado	35	2,966,951	2
Texas RR #7C	21	1,392,855	6
North Louisiana	19	1,284,590	7
Texas RR # 2	15	760,602	10
Utah	13	2,086,944	4
Texas RR # 9	13	2,405,598	3
Montana	12	641,968	13
13 Zone Total	399 (of 499 gain)		
by Comparison			
South Louisiana (land)	0	1,399,774	
Louisiana Inland Waters	-2	712,517	
Louisiana Offshore (federal and state)	-6	2,426,272	
Louisiana Total	11		

Coalbed methane reserves figure prominently in the above calculations. At this time, the leading producers of coalbed methane include: Colorado, New Mexico, Wyoming, Utah, and Alabama. Coalbed methane is categorized as unconventional gas in the Internal Revenue (IRS) Code. The tax incentive that applied to coalbed methane was referred to as the Section 29 gas tax credit (the Section of the IRS code). Shale gas also falls into this category. Substantial drilling initiatives are currently underway in North and Central Texas (the Barnett Shale play) and Eastern Oklahoma (the Arkoma Basin) for new discoveries and production of relatively shallow unconventional and conventional natural gas.

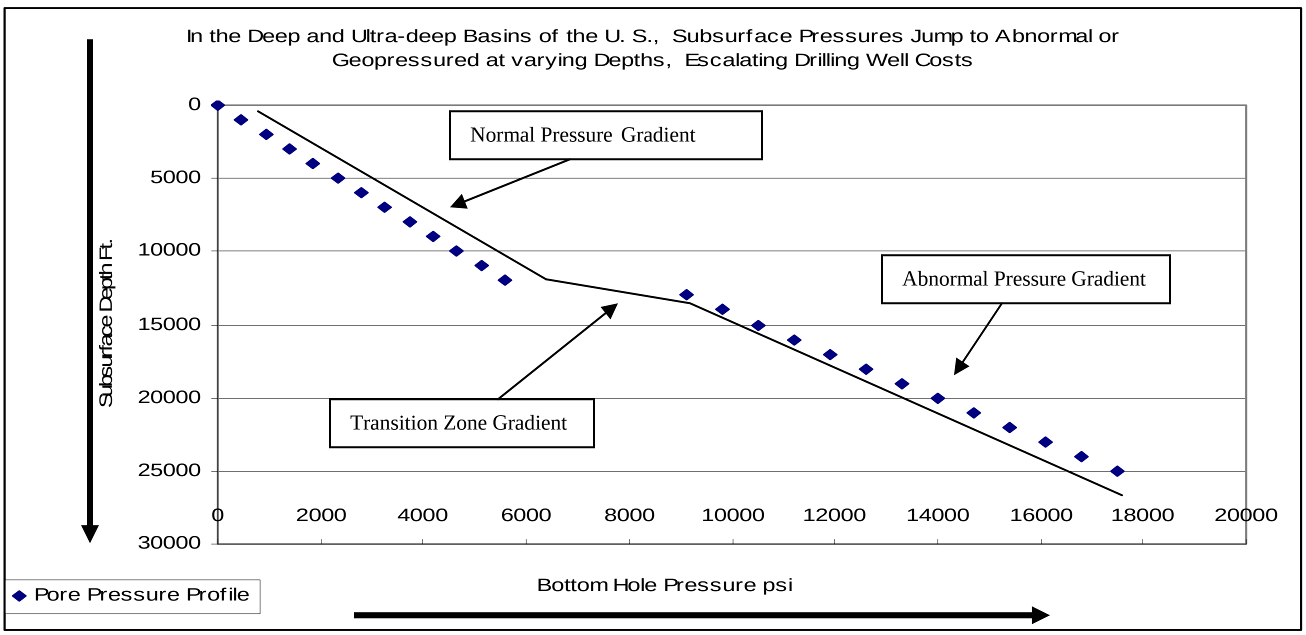
Louisiana's shallow reserves were discovered years ago. Louisiana is a deep drilling province today and its reserve discovery rates compare favorably with the metrics developed for the 13 rig count gaining areas. But another factor is worth considering at this point. In the December 29, 2003 edition of "Gas Daily," an article appeared entitled "In New Logic of Wall Street Losing Gas Supply is a Virtue." The article quotes Lehman Bros. analyst, Thomas Driscoll, "Investors now reward those companies that curtail (exploration) spending and devote the excess cash flow to debt reduction, acquisitions, share buybacks and dividends. We expect 2004 to bring more of the same."

The message from Wall Street - avoid risk. It should be clear Wall Street analysts who adopt this position are concerned neither with future energy supply nor with security for the economy or the nation. Deeper drilling areas are disadvantaged by these attitudes. Who is challenging this investment theme?

A Technical Factor Directly Affecting Cost

If there is one factor that drives drilling costs higher more than any other, it would be subsurface pressure. Louisiana is known as a geopressured drilling region, more so than any other producing province in the U. S. --even in the world. (NOTE: Drillers refer to "geopressured," as a pressure gradient expressed in pounds per square inch per foot of depth [psi/ft]. A normal pressure gradient is a saline water gradient of 0.465 psi/ft.]. This geopressure is both a blessing and detraction. Higher reservoir pressures mean potentially higher quantities of reserves in the reservoirs and deliverability from the reservoirs. Higher drilling pore pressure profiles inevitably lead to higher drilling costs and drilling risk.

A generalized plot is illustrated in the graph below, showing Subsurface Pressure from Surface Level down to Subsurface Horizons.



In North Louisiana and East Texas, the Cotton Valley Pinnacle Reef Play is geopressured; all of South Louisiana and the Federal Gulf of Mexico are geopressured; the Texas Gulf Coast is geopressured; the Anadarko Basin of the Texas Panhandle and Oklahoma encounters geopressured horizons; the Delaware Basin (in the West Texas Permian Basin) has geopressured producing horizons; as does the Wind River Basin of Wyoming.

Normal pressure (typically expressed as 0.465 psi/ft), or in some cases subnormal pressure, extends down to varying depths across each of these deep basins or provinces. And the geopressure ranges of commercially producing horizons generally vary from 0.6 psi/ft to 0.8 psi./ft.

What does it all mean?

Perhaps the summary arbiter of where companies drill is contained in a comparison of how aggregate drilling budgets have been allocated by state/zone. To express this relationship it is again necessary to use the Joint Association Survey of Drilling Costs for the most recent periods for which the data are available (1999-2002), and to use a multi-year period to smooth out annual randomness.

The Top Three Drilling Expenditure Regions (1999-2002) Dominate Domestic Industry Drilling Budgets

Political Subdivision	Wells Drilled 1999-2002 Year Total	Drilling Expenditures 1999-2002 Year Total
Texas	26,719	$26,260,881,000
Federal Offshore	2,090	$18,631,296,000
Louisiana	5,009	$17,630,068,000
subtotal	33,818	$62,522,245,000
% of U. S.	34.86%	81.68%
U. S. Total	97,010	$76,549,494,000

From 1999-2002, nearly 82% of U. S. drilling expenditures were directed into the Gulf South (includes the Federal Gulf of Mexico, Louisiana, and Texas), **the deep drilling province** of the United States. This expenditure was incurred on only 35% of the total wells drilled during the period**. Louisiana ranks 3rd from among all 50 states and offshore waters as the geographic location for industry drilling expenditures during this period.** Louisiana has consistently been among the top targets for the industry in terms of expenditures. If the number of wells drilled per rig declines with depth, the cost of drilling increases with depth, and the investment in rig equipment escalates for deeper drilling, it is safe to conclude the rate of growth in number of rigs working will be lower in a deep drilling province.

If the metric of reserves discovered per rig per year are among the highest in a deep drilling province (e.g., the Federal Gulf of Mexico and South Louisiana), it is safe to conclude the greater amount of expenditures will be incurred in those provinces and, therefore, not directly related to large escalations in rig count.

It is also safe to conclude that a federal tax credit is far more powerful than State tax incentives. And if a federal tax credit of nearly $1.00/Mcf can be earned for developing unconventional gas production, and since coalbed methane/shale gas are reached at shallower depths, it is safe to conclude an increased drilling and rig count emphasis will be directed to these areas. The top 5 BOE/Rig/Year areas for 2000-2002, Wyoming, Colorado, Texas RR#9, Utah, and New Mexico, are coalbed methane or shale gas drilling areas, i.e., “hot” plays.

It would be safe to conclude that many factors go into determining rig count, and the rate of growth in rig count. State tax incentives are only one such factor -- and appear to be a very limited consideration at that. Absent significant federal tax incentives which tilt the level playing field, the abundance of reserve opportunities with higher reservoir deliverability are a most compelling incentive for drilling and producing oil and natural gas--in Louisiana, the U. S. (and elsewhere).

For years, the Louisiana legislature, Governor’s office, and state regulatory agencies have assisted industry in developing the technology and best practices for drilling and producing oil and natural gas on land, in the wetlands areas, and in open offshore marine areas. As the industry is faced with a skeptical Wall Street, and the need to explore deeper horizons here in the U. S., it may be that State political leadership with non-tax initiatives will be more meaningful in advancing the economic health of the industry, the State, and the domestic economy.

This would be consistent with Governor Blanco's objectives for economic development by accentuating the state's positives and promoting the advantages of doing business in the state. The economic metric of BOE/rig/year for Louisiana may be a tool in sustaining that political initiative.

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COMMERCIAL ENERGY CONSERVATION CODE UPDATE

by

Darrell Winters., P.E

Background

The 1997 Louisiana Legislature enacted the Commercial Building Energy Conservation Code. The state legislation was mandated by Congress as part of the National Energy Policy Act of 1992 (EPAct) which requires that states incorporate energy efficiency standards into their building codes for commercial buildings.

The intent of Congress was to develop a national energy strategy that protects U.S. national security interests by reducing reliance on imported energy supplies, enhances the competitiveness of U.S. companies in a global economy by reducing energy costs, and protects the environment and quality of life of US citizens.

It is estimated that EPAct mandated building energy codes will prevent 6.5 million metric tons of carbon from being dispersed into the atmosphere, result in energy savings equivalent to almost 1,000 new fossil-fueled power plants, and save building occupants over $1.5 billion per year in energy costs.

Louisiana's legislation was reviewed by a comprehensive commercial building industry advisory committee, representing all facets of the commercial building industry. In Louisiana, commercial buildings are defined as all buildings designed for human occupancy, except residential buildings of three stories or less. For multifamily residential buildings of three stories or less, the applicable code is the Council of American Building Officials Model Energy Code (CABO MEC). For all other commercial buildings, the adopted code was American Society of Heating, Refrigeration, and Air-conditioning Engineers/Illuminating Engineering Society of North America (ASHRAE/IESNA) Code 90.1-1989 (see existing code below).

The code only applies to new commercial buildings and buildings that undergo major renovation. Exempt from the code are buildings of less than 1000 square feet gross floor area; buildings, or portions of buildings, with a peak energy use for space conditioning, water heating and lighting of less than 3.5 Btu/ft^2; and buildings, intended primarily for manufacturing, or commercial or industrial processing. In addition, special allowances are made for historic buildings.

Implementation of the code is via plan review in the State Office of Facility Planning for state buildings, and in the State Fire Marshal's office for all other commercial buildings. It has been incorporated into their existing plan review processes. After evaluation of building plans, the reviewer provides the builder with a letter of apparent compliance or a letter of apparent noncompliance. Builders may appeal the issuance of a letter of apparent noncompliance, if they so desire.

The energy code took effect July 1, 1998, for state buildings; January 1, 1999, all other commercial buildings. However, beginning July 1, 1998, builders could voluntarily submit their energy code documents to the State Fire Marshal for review and determination of compliance.

Existing Code

Effective January 1, 2004, the State of Louisiana adopted the International Building Code (IBC) 2000 as its Uniform Construction Code. Since the IBC 2000 states, “The provisions of the International Energy Conservation Code (IECC) shall apply to all matters governing the design and construction of buildings for energy efficiency," the state is presently following the IECC 2000. IECC 2000 is based on ASHRAE / IESNA Standard 90.1-1989, except in the area of lighting, which is based on the 1999 Standard. Chapter 8 covers all commercial buildings, including those with multi-zone HVAC systems.

U. S. Department of Energy Determination

Approximately every three years the Department of Energy makes a determination regarding building energy efficiency. On July 15, 2002, the DOE published its determination in the Federal Register that the ASHRAE / IESNA Standard 90.1-1999 would improve commercial building energy efficiency (exclusive of low-rise residential buildings) in comparison to Standard 90.1-1989. This determination applies to all new commercial buildings and all major remodeling and renovation of existing buildings. All states had two years to adopt Standard 90.1-1999 or upgrade their existing commercial building energy codes to meet, or exceed, its requirements. Any states that are in the process of reviewing and updating their building codes, but will not have it completed by July 15, 2004, must submit a Request for Extension of Deadline prior to July 15, 2004. The State of Louisiana submitted the Request for Extension in mid-June 2004 and received an extension to August 4, 2005 to comply.

Adoption of New Code

As required by state law, the Office of the State Fire Marshal, the Department of Natural Resources and the Department of Administration / Office of Facility Planning and Control are working together to review and recommend the adoption of a building energy code which meets or exceeds ASHRAE / IESNA 90.1-1999. It has preliminarily been decided that ASHRAE / IESNA 90.1-2001 is the best choice at this time. The 2001 Standard is essentially the same as the 1999 version, but corrects many typographical errors and includes 34 addenda. The procedure for adopting a new code is detailed by Louisiana legislation in R.S. 40:1730.

Complying with the Energy Code

The accepted method of documenting compliance is COMcheck-EZ. COMcheck-EZ can be downloaded from www.energycodes.gov. After selecting "Louisiana" and "2000 IECC," all design characteristics of the proposed building are entered behind each of the four tabs via pull-down menus. Compliance or non-compliance with the code is shown at the bottom of the form on the screen. After entering all data, the three required compliance forms (Envelope, Lighting and Mechanical) are printed (File / Print Report) and mailed to the Office of the State Fire Marshal.

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RENEWABLES COUNCIL OF LOUISIANA

by
David McGee., P.E.

Renewables resources include: wind power; hydropower; solar (photovoltaics and thermal-electric); geothermal energy; biomass generated energy; waste-to-energy, including landfill gas; biofuels refining and bio-feedstock chemical technologies. Louisiana has no significant wind resource on land, variable solar resources, very limited hydro resources, and little geothermal resources. What Louisiana does have is a significant amount of fertile land that produces abundant agricultural crops having copious quantities of byproducts that can be converted to fuels or organic chemicals.

What is Biomass?

Biomass consists of renewable organic materials including forestry and agricultural crops and residues, wood and food processing wastes, and municipal solid waste. Louisiana generates increasing tonnages of biomass waste annually. Much of these materials are disposed of at significant financial and environmental costs to companies and citizens of the state. One man's waste is another man's raw material.

The Renewables Council of Louisiana (RCL), formerly known as the Louisiana Biomass Council, was established by the Louisiana Department of Natural Resources (DNR) under a contract with the Southern University Center for Energy and Environmental Studies. DNR, Louisiana Economic Development (LED) and the Louisiana Dept. of Agriculture & Forestry (LDAF) encouraged the further development of this group into a public interest group that is now incorporated as a 501(C)(3) non-profit organization.

The council coordinates its activities with various state departments and agencies, local government and businesses, acting as a catalyst for increased biomass utilization in Louisiana. The council desires to provide input for future renewables and waste-to-energy policy.

A primary focus of RCL is to promote renewable energy demand by encouraging statewide planning and coordination of biomass resource and solid waste utilization in Louisiana. Economic development and environmental improvement will be a by-product. To accomplish this, the council networks entrepreneurs, experts and other individuals interested in converting renewable organic resources into energy or commercial products. RCL is currently looking for support to explore the feasibility of a bio-refinery project in the state.

Three meetings, or mini-conferences, are held each year to identify business and economic development opportunities and to provide a networking opportunity for members. Attendance by those who have an interest in biomass/renewable energy from the business community is encouraged.

Louisiana Biomass Resources

Louisiana is rich in biomass resources by virtue of its productive agriculture and forestry industries and has substantial bio-energy and bio-product potential in comparison to other states. Public awareness of the presence of these resources is very limited. Increasing awareness of the value of biomass is one of RCL's primary objectives.

In Louisiana, our large quantity biomass resources consist mainly of sugarcane bagasse, filter press cake, rice hulls, cotton gin trash and sawmill waste. Pulp and paper mills and sawmills are numerous in the state and many utilize their waste for fuel. Wood processing residue is in demand by nurseries, landscaping businesses, and by industrial plants as fuel. Alternative biomass resources available in smaller quantities include Johnson grass, kenaf, bamboo, giant ragweed, thistles, tree trimmings, sugarcane leaves, rice and wheat straw, pecan pith and shells, construction and forest residues, and "weed trees" such as shade mulberry, tallow, and black willow. Animal wastes, including manure, dairy lagoon solids, poultry litter and race track stable bedding are available in some areas. The federal government and a number of states have ongoing efforts to increase the capture of energy and value-added products from these materials.

Mission Statement

The Renewables Council of Louisiana strives to increase development and utilization of renewable resources for energy industries, chemical industries, sustainable agriculture, and ecological stability by:

1. Promoting research that aids government and business entities use of renewable resources to reduce pollution, improve economic activity, produce energy or produce consumable products;
2. Taking an active role to implement projects related to beneficial use of biomass, solar, wind, municipal solid waste (MSW), and other renewables;
3. Collecting and disseminating data and expertise related to renewables production and management, and implementation of renewables in beneficial use programs;
4. Working with renewables generators, municipalities and communities, and industries to provide economic development opportunities within the state;
5. Creating a business environment that attracts renewables related businesses to Louisiana.

The benefits of the Renewables Council of Louisiana activities will be increased economic activity, enhanced air and water quality, improved environmental stability, increased biomass use in bioremediation and as a soil amendment, increased recycling of organic materials, and improved waste management.

Renewables related topics of interest:

- Hydrogen generation, transport, storage, and use from renewable sources,
- Other technologies and solutions in and related to clean and renewable energy,
- Green pricing and Green power marketing,
- Renewable portfolio standards,
- Federal, state and local incentive programs,
- Interconnection issues,
- Energy storage in support of renewable energy installations.

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The Effect of Hurricane Ivan on Oil and Gas Production in the Gulf of Mexico

by
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Weather often increases demand for heating oil and natural gas during cold winter months and can seriously affect demand for electricity during the summer cooling season. Weather also has distinct short term effects on the energy supply.

In late summer and early fall 2004, the Gulf of Mexico experienced several tropical storms. Seven storms formed in August and five in September. There were three that reached hurricane force, Frances (Category 4), Ivan (Category 5), and Jeanne (Category 2), and arrived in rapid succession, impacting many of the same areas of the Gulf.

Not to downplay the effects of any tropical storm that enters the Gulf, or makes landfall near populated areas, however, Hurricane Ivan was particularly disastrous because it blew through one of the more active oil and gas exploration and producing areas and disrupted the business of supplying energy.

Prior to Hurricane Ivan, repeat alarms from Tropical Storm Bonnie and Hurricanes Charley and Frances, with subsequent storms Hurricane Jeanne and Tropical Storm Matthew only served to worsen the situation.

Damage from Hurricane Ivan is, so far, the most expensive for the Gulf of Mexico oil and gas industry. The U.S. Department of Energy estimated the gas shut-in from Hurricanes Lilly and Isidore, combined, totaled 85 BCF - 90 BCF in 2002, although damage to platforms and pipelines was much less extensive. Some of the reported damage by Hurricane Ivan included the destruction of seven platforms.

Hurricane Ivan has caused 120 BCF (2.7% of the Gulf of Mexico annual production) of gas and 29.9 MMBLS (4.9% of the Gulf of Mexico annual production) of oil shut-in, thus far, and extensive damage to delivery pipelines. The effect of Hurricane Ivan on producers' cash flow is enormous. They were hit by lost production when the price of oil and gas is at its highest.

The U.S. Minerals Management Service (MMS) stated that Ivan, at its high, forced the evacuation of 574 platforms (75% of the Gulf's manned platforms) and 69 rigs (59% of the Gulf's drilling rigs). Daily oil production was shut-in at 83% and gas production shut-in at 53% of operations. As of November 15, 2004, a total of nine platforms and one rig remain evacuated. Thirteen percent of oil daily production and 6% of gas daily production remain shut-in due to delivery and gathering pipelines problems.

Damage to the infrastructure by Hurricane Ivan cannot be adequately measured in terms of how many platforms or rigs were destroyed. The most damage was discovered in the pipeline routes. It was reported that some pipelines in the mouth of the Mississippi River were moved 3,000 feet while others remain buried under 30 feet of mud and cannot be found. It could take as long as 6 months and a significant amount of effort to locate and repair these pipelines.

Hurricanes are highly complex weather systems capable of generating incredible amounts of energy. Damage to lives and property is due to high speed winds, water, and tornados precipitated by the weather system.

Depending on duration and storm intensity as the hurricane approaches land and the water becomes shallower, it begins to push large amounts of water in front of it called storm surge. Storm surge, combined with normal tides, creates a hurricane storm tide which can increase the mean water level 15 feet or more.

This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with normal high tides. Most of the Louisiana Gulf Coast elevation is equivalent to mean sea level, thus, the danger from storm tides is tremendous. The level of surge in a particular area is also determined by the slope of the continental shelf. A shallow slope off the coast will allow a greater surge to inundate coastal communities.

Storm surges of 20 - 25 feet are not unheard of. In 1969, Hurricane Camille produced a 25-foot storm surge in Mississippi; in 1989, Hurricane Hugo generated a 20-foot storm tide in South Carolina. When the water from these surges strike land it swamps low lying areas and causes severe damage to unprotected coastal areas. Models have predicted that a slow moving category 4 hurricane could produce a surge sufficient to flood the New Orleans Vieux Carre with six feet or more of water.

The wetlands infrastructure is, also, adversely affected. Any storm path with a category 5 intensity coming onshore between Vermilion Bay and Fourchon would place the NE quadrant over the most production intense part of the marsh. The Louisiana Offshore Oil Port's (LOOP) Fourchon pumping station would disappear. Port Fourchon would disappear and the bayou would fill with sediment. It would take months to assess the extent of the recovery job, mobilize to begin dredging, dredge, locate missing pipelines, re-stabilize the foundations (for pumping stations and for underwater pipelines), repair and/or replace the pipelines, and rework wells and restart flow.

Since there are numerous pipelines offshore bringing flow from the many platforms and wells, the marsh is the area of flow consolidation. There are probably three natural gas pipelines and three oil pipelines which are most vulnerable. These include Henry Hub, St. James terminal and LOOP pipeline; Shell pipeline from St. James, LA to the Midwest, Venice gas processing plant and pipeline; Baldwin gas processing plant and pipeline; Garden City gas processing plant and pipeline; and refineries and their associated pipelines along the Mississippi River. Additional crude access would entail transfer of oil from very large crude carriers (VLCC) to lighter vessels and barges.

Anecdotal evidence provides a glimpse into the power of Hurricane Ivan when damage to one offshore rig was done nearly 80 feet above the Gulf's surface. This and other evidence suggests the possibility of a rogue wave also contributing to the storm damage. Hurricane Ivan was not an ordinary hurricane; national weather and industry sources indicated wave damage that would be on the extreme high end for a category 5 hurricane.

MMS reported five Mobile Offshore Drilling Units were set adrift and one mobile unit sustained extensive damage, seven fixed platforms were destroyed, four others were extensively damaged, and 13 pipeline leaks were located, including one that resulted in a fire which burned itself out. Individual companies estimated down time from 10 - 21 days. Potentially, some of the more severely damaged platforms are permanently lost. Some mobile units have been moved to ship yards to undergo inspection and repair; their outage is still to be determined.

Almost all of the information on oil and gas production disruption in the Gulf of Mexico was provided by MMS. That data focuses in the outer continental shelf, but does not account for data pertaining to the state regulated near shore areas. MMS requires damage reports from producers while the state does not.

Production losses for the storm in the Louisiana regulated coastal waters are, at this point, undetermined. It is hoped that it will be less severe than that in the OCS.

Storms such as Ivan damage production facilities leaving the energy production infrastructure more vulnerable to catastrophic loss. This vulnerability to damage increases as Louisiana's protected marshes and barrier islands disappear. Buried oil and natural gas pipelines are subject to irresistible bending forces from hurricanes' movement of sediment. As storms move from deeper water onto the shallower shelf, and as the storm pressure lowers (thus, the greater the storm category), the greater is the damage due to underwater erosion. This could be thought of as the equivalent of an avalanche of snow, except it is an avalanche of sediment on the marsh or shelf bottom.

Loss of platforms near the shore has been a factor in the offshore industry from the beginning. The mouth of the Mississippi River has a very unstable bottom. Pipelines have disappeared in other storms as well. The unstable Gulf bottom areas of the Louisiana shelf run from the mouth of the Mississippi to near Vermilion Bay. The shelf bottom becomes a bit more firm to the west, but the marsh all across the state from the Mississippi River to the Texas state line is unstable.

Damage to oil and gas pipelines in the coastal zone has been unusually high. Even if offshore production was available, moving it onshore to process and market would be more difficult due to pipeline loss.

As a note aside, not all weather related disruption to production is due to hurricanes. Louisiana, in particular the southern portion, is noted for its subtropical climate and moderate winter temperature. Temperatures below 30° F in the southern parishes are uncommon, lasting only a few hours or days of the year. If the temperature drops ten degrees below that, and stays for an extended period, it can create another unusual set of conditions since very little equipment is designed for sustained cold temperatures.

It is not uncommon during winter months (usually November – February) for weather fronts from the north to reduce oil and natural gas production in both north and south Louisiana, including production over marsh lands and open water. The combined effect of temperature and wind lowers the effective temperature which can cause control valves on production equipment and well heads to freeze and blow out burners used to heat water baths for heat exchange. The result is a reduction in available production at the time of highest market (heating) need.

As these winter fronts pass through the state, they drive the water (tides) from the bayous and marsh waterways rendering transportation by boat an unreliable source for access to the downed facilities. Remedial action to unfreeze the equipment and restart production may have to wait added days at this critical time. It is possible that as much as 25% of the nation's oil and natural gas production could be substantially disrupted.

Weather is a variable that needs to be factored into the effects on oil and gas supply. Infrequent, but regular, weather events like Hurricane Ivan will cause serious supply reductions and resultant short term price increases.

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Offshore Louisiana Wind Power

by

Bryan Crouch, P.E.

Introduction

The topic of offshore wind generated electricity in Louisiana recently received a lot of attention stemming from several sources. First of all, high fossil fuel prices and steady decreases in the cost of wind power equipment have collaborated to make the economics of wind power feasible in many cases. In fact, in some areas of the U.S., wind power can and does compete with conventional forms of electrical power generation. Second, a recent Stanford University study (Archer and Jacobson, 2003) suggests that the Gulf of Mexico may possess a greater wind resource than previously thought. Finally, a south Louisiana company has proposed placing wind power plants in state and federal waters offshore Louisiana. This article explains the basics of wind generated electricity and how it relates to Louisiana.

Extraction of energy from the wind is not a new idea. Windmills, predecessors to modern wind turbines, have been around since the 6th century when they were used to pump water and grind grain. Wind turbines consist of a blade/hub assembly, gear box, generator, and tower. Wind turbines extract energy from the wind in much the same manner as did ancient windmills, but instead of using the resultant mechanical energy directly, the turbines use it to drive generators that produce electricity.

Utility-scale wind turbines are very large and have blade diameters up to 300 feet and towers that are, roughly, the same height as the blade diameter. A wind turbine with a 260 foot blade diameter would be almost 400 feet tall from ground or sea level to the tip of the blade at the top of its rotation. Larger ones are currently under development. Wind turbine blades are usually made from wood or fiberglass and the towers from steel.

The rated power of current, utility-scale wind turbines ranges from 600 kilowatts (kW) to over 3 megawatts (MW). Units with much higher rated output are being developed. A wind turbine's rated capacity is the amount of power the turbine will produce at a particular wind speed. The actual power output of a particular wind turbine is completely dependant upon how often and how hard the wind blows at a particular location.

The efficiency of a wind turbine is defined as the energy input, i.e., energy contained in the wind, divided by the energy output of the wind turbine. The theoretical maximum efficiency, known as the Betz limit, is 59.3%. The efficiency of a particular wind turbine varies with the wind speed. Current wind turbines have maximum efficiencies of around 50% at a particular wind speed, but are much less efficient at higher or lower wind speeds. Efficiency, however, is not the primary consideration because the wind is free and supply is practically unlimited. By comparison, automobile fuel efficiency would not be a cause of concern if fuel was free and its supply unlimited.

A more meaningful measure of wind turbine performance is the capacity factor. The capacity factor is defined as the ratio of a turbine's actual energy output for the year divided by the energy output if the turbine operated at its rated power output for the entire year. Common capacity factors range from 25% to 40% for wind turbines.

In order to generate significant amounts of electricity, wind turbines are situated in groups called wind farms. The U.S. wind power capacity has increased from 10 MW in 1981 to 6,374 MW (about two-thirds of one percent of the total U.S. electric generating capacity) in 2003. No offshore wind farms exist in the

U.S. due to the higher costs involved with placing turbines over water and running transmission cables back to shore, but several are proposed.

Pros and Cons

The lure of wind generated electricity lies in its status as a renewable and non-polluting resource. Wind gets its renewable nature from the sun. Solar radiation heats some parts of the earth's atmosphere more than others creating temperature differences that cause the air to move. As long as the sun burns, there will be wind, making it renewable. Wind is non-polluting; there is no combustion, or any other chemical or nuclear reaction, consequently, there are no emissions and no waste to be disposed.

The main drawbacks to wind generated electricity are its high capital costs and the intermittency of the wind. The high capital costs result from the fact that, like all solar energy, wind is a diffuse source of energy. This means that a large number of wind turbines are required for a wind farm of significant capacity. For perspective, in order for wind to generate 1% of the electricity in Louisiana, 180 two-megawatt wind turbines would be required, assuming a 30% capacity factor for wind. The intermittency of the wind leads to increased operating costs for grid operators. The grid system must maintain a precise balance between the demand for power and the power generated by all of the power plants on a particular grid. Wind speed, hence power output from wind turbines, fluctuates greatly during the day and is unpredictable, making the balancing act more difficult and costly. In general, these costs are referred to as ancillary service costs. Ancillary service costs associated with wind power are not presently well known, but studies estimate a range from 0.15 – 0.55 cents/kilowatt hour (kWh).

Other purported drawbacks of wind power include both aesthetics and associated bird fatalities. The aesthetic value of a wind turbine is subjective. The Cape Cod Wind project off the New England coast is on hold this month because many residents object to the impact a wind farm will have on wildlife, aesthetics and recreation. Louisianians are accustomed to seeing offshore oil and gas structures; wind turbines should not be a problem. In the past, bird kills have been a problem for older wind turbines that rotate fast making the blades difficult to see. Newer, larger wind turbines rotate much slower making the blades easily visible. Bird kill statistics for these turbines average about one bird per turbine per year.

Economics

Installation costs for utility scale wind farms are in the neighborhood of $1000/kW for onshore systems and $1500/kW or more for offshore systems. By comparison, the capital cost for conventional natural gas turbine capacity is about $350/kW. It should be noted however, that almost no one is currently considering building any natural gas power plants due to high natural gas prices. If natural gas prices remain high, as most analysts predict, most new electrical generation capacity will be built using coal and nuclear fuel. A new coal power plant would cost about $1000/kW and a nuclear plant about $1500 - $2000/kW. Given these prices and, in general, less red tape and permitting problems associated with wind than with coal and, especially, nuclear, and lower operating costs with wind, i.e., no fuel costs and low maintenance costs, wind power starts to become attractive.

The direct cost is ultimately what determines the competitiveness of a particular type of power production. Over the last 15 years, the direct cost (cents/kWh) of wind power has fallen 85%, and, in some cases, is competitive with coal and natural gas power. The reductions in cost have resulted mainly from the development of larger, more efficient turbine designs. Another key factor that makes wind power more competitive is the recent price increases for conventional fuels. Prices for wind energy are usually quoted including a federal production tax credit (PTC). The PTC was enacted in 1992 with the Energy Policy Act and was recently extended through 2005 and raised from 1.5 to 1.8 cents/kWh. The PTC, which is not applicable to existing production facilities, is available to companies for new production of renewable energy including solar, biomass, geothermal, and wind power. Future advances in turbine technology are expected to reduce the cost of wind power even further and to eliminate the need for the PTC, yet the ability of wind power to be competitive ultimately depends on the wind resource.

Wind Resource

The most fundamental and significant cost factor of wind generated electricity is the wind itself, specifically, how often and how hard it blows. For a given location, values for the speed and frequency of the wind must be known or assumed in order to calculate the cost of wind generated electricity. To a degree, a wind turbine will produce more power with higher wind speeds. More power per turbine equals lower costs. The power available in the wind is proportional to the cube of its velocity, so if the wind velocity doubles, the power available would increase by a factor of 8. This means that a small increase in wind velocity will significantly increase the power output of a wind turbine. Wind resources are classified by the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) (Table 1.). Wind speeds are given at a height of 50 meters. This is because wind speed increases with height above ground or sea level. In general, a class 4 wind resource is required for a commercially viable wind farm.

Wind Power Classification		
Wind Power Classification	Resource Potential	Wind Speed @ 50 meters (mph)
2	Marginal	12.5 - 14.3
3	Fair	14.3 - 15.7
4	Good	15.7 - 16.8
5	Excellent	16.8 - 17.9
6	Outstanding	17.9 - 19.7
7	Superb	19.7 - 24.8

Table 1. Standard Wind Resource Classification

Louisiana's onshore wind resource has virtually no potential for wind power development. The wind speed and frequency is not sufficient enough to make wind power economical. This is fully documented in *Evaluating Wind Energy Potential in Louisiana* (1981). Louisiana's offshore wind resource is, to date, still somewhat unknown. Stanford University (Archer and Jacobson, 2003) suggests offshore Louisiana may have great potential with several areas containing class 7 winds. A recent analysis of the available data completed by NREL (M. Schwartz, unpublished data) for the Louisiana Department of Natural Resources concludes that the offshore Louisiana wind resource is generally class 3 or 4. Wind speed data does not exist in which the measurements have been taken at the hub height of modern wind turbines, about 80 meters. To begin to understand the differences among the conclusions of these studies it is important to note the chosen methodologies used to extrapolate measured wind speeds from the height at which they were taken to the hub height of a wind turbine. Whereas Stanford developed an entirely new method for this calculation, NREL used a pre-established method which Stanford researchers claim underestimates the wind speeds.

What this means to Louisiana

It bears repeating that the ability of wind power to be competitive ultimately depends on the wind resource. If the offshore Louisiana wind resource proves to be extraordinary, as some predict, the potential benefits to Louisiana by tapping into that resource are many.

The proposed project, previously described, involves placing wind turbines and related equipment on abandoned oil and gas structures, as well as, on new purpose-built structures offshore of Louisiana. If built before the Cape Wind Project, this project would be the first offshore wind farm in the U.S. A typical wind farm would consist of, approximately, 25 two-megawatt turbines spread out over about 3 square miles. The project would provide power for onshore uses and, perhaps, for offshore uses including oil and gas exploration and production, as well as for LNG facility operations. To the extent that it is feasible to use abandoned oil and gas structures, such use could save owners the expense of dismantling these structures once oil and/or gas production ceases. It would also keep the structures in place for any future advances in oil and gas extraction technology which would allow previously uneconomically recoverable oil and gas to be recovered.

Many states are implementing a renewable portfolio standard (RPS). A RPS requires affected electricity distributors to acquire a certain percentage or quantity of their electricity from renewable resources. This requirement makes way for a renewable energy trading market in which a renewable energy generator can sell renewable energy credits (REC), or green tags. This would potentially make RECs from Louisiana offshore wind farms exportable to distributors in other states that have to satisfy a RPS but do not have access to an economically viable renewable resource in their own state.

Offshore wind energy offers Louisiana an opportunity to sustain the oil and gas service industry as many of the same service industries and technologies used in the construction of offshore oil and gas structures can be utilized directly, or be easily adapted to construct offshore wind farms. Louisiana has a long history of being a leader in energy production and technology. As oil and gas production in the state continue to decline, offshore wind energy could help Louisiana maintain its leadership role in the energy industry.

References

1. Archer, C. L. and M. Z. Jacobson. 2003. Spatial and temporal distributions of U.S. winds and wind power at 80 m derived from measurements. http://fluid.stanford.edu/~lozej/winds/2002JD002076.pdf. Accessed 12-01-04.

2. Mike French, Evaluating Wind Energy Potential in Louisiana (technical report, Louisiana Department of Natural Resources, Research and Development Division, 1981). http://dnr.louisiana.gov/sec/execdiv/techasmt/data/alternative/windreport1981.html

For more information on wind energy:

- **American Wind Energy Association**
  http://www.awea.org/
- **National Wind Coordinating Committee**
  http://www.nationalwind.org/default.html
- **U. S. Department of Energy/Energy Efficiency and Renewable Energy**
  http://www.eere.energy.gov/RE/wind.html
- **National Renewable Energy Laboratory/National Wind Technology Center**
  http://www.nrel.gov/wind/